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THE

Popular Educator.

VOLUME THE SIXTH.

STUDIES serve for delight, for ornament, and for ability. Their chief use for delight, is in privateness and retiring; for ornament, is in discourse; and for ability, is in the judgment and disposition of business: for expert men can execute, and perhaps judge of particulars, one by one; but the general counsels, and the plots and marshalling of affairs, come best from those that are learned. To spend too much time in studies, is sloth; to use them too much for ornament, is affectation; to make judgment wholly by their rules, is the humour of a scholar; they perfect nature, and are perfected by experience; for natural abilities are like natural plants, that need pruning by study; and studies themselves do give forth directions too much at large, except they be bounded in by experience.—*Bacon.*







LONDON:
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TO OUR READERS.

The present Series of the Popular Educator is now completed, and in presenting these Six Volumes to the Public, we may confidently call them an Educational Cyclopædia, comprising a vast amount of solid and useful information in a popular form, and at a price unprecedented even in the present age of Cheap Literature. The highest encomiums have been bestowed upon our labours by a large portion of the Public Press, by learned Professors, by Teachers of Youth, and by a host of Students who have profited by our Publication. Every post has brought us numerous expressions of gratitude for the seasonable and valuable aid we have rendered, and of deep regret that we have brought our labours to a close. We take our respectful leave of our friends, thanking them sincerely for the assurances they have given us that we have not laboured in vain.

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CONTENTS.

PAGE

LESSONS IN ALGEBRA.

XXI. Powers of Roots; Evolution; General Rule for Evolution; Reduction of Radical Quantities 8
XXII. Addition of Radical Quantities; Subtraction of Radical Quantities; Multiplication of Radical Quantities 26
XXIII. Division of Radical Quantities; Involution of Radical Quantities; Evolution of Radical Quantities 45
XXIV. Reduction of Equations by Involution; Reduction of Equations by Evolution; Adfected Quadratic Equations 105
XXV. Method for Completing the Square; Second Method for Completing the Square; Demonstration; Other Methods of Completing the Square, General Rule 119
XXVI. Problems in Adfected Quadratic Equations; Ratio and Proportion 158
XXVII. Compound Ratio; Proportion; Arithmetical Proportion and Progression 183
XXVIII. Geometrical Proportion and Progression 216
XXIX. Problems in Geometrical Progression; Evolution of Compound Quantities 248
XXX. Application of Algebra to Geometry 311

LESSONS IN ARITHMETIC.

XXX. Decimal Fractions; Decimal Table; Exercises; Addition of Decimal Fractions 56
XXXI. Subtraction of Decimal Fractions; Multiplication of Decimals; Contractions in Multiplication of Decimals; Division of Decimal Fractions; Contractions in Division of Decimals 78
XXXII. Periodical, or Circulating Decimal; Reduction of Circulating Decimals; Addition of Circulating Decimals, &c. &c. 102
XXXIII. Percentage; Commission; Brokerage; and Stocks 136
XXXIV. Interest; Compound Interest 166
XXXV. Discount; Bank Discount; Insurance 193
XXXVI. Life Insurance; Profit and Loss 232
XXXVII. Analysis 254

BIOGRAPHY.

XV. William Pitt 149
XVI. James Thomson 181
XVII. David Hume 215
XVIII. Samuel Johnson 229
XIX. William Robertson 246
XX. Edward Gibbon 262
XXI. Oliver Goldsmith 276
XXII. William Cowper 291
XXIII. Felicia Dorothea Hemans 306
XXIV. Sarah Margaret Fuller 322
XXV. Laura Bridgman 339
XXVI. Catharine Maria Sedgwick 354
XXVII. Mrs. Trollope 370
XXVIII. Mary Russell Mitford 387
XXIX. Lydia Huntley Sigourney 403

LESSONS IN FRENCH PRONUNCIATION.

I. Alphabet; Accents; Cedilla; Dieresis; Hyphen; Apostrophe; Euphonic *t*; Parenthesis; Asterisks 4
II, III. Name and Sound of the Vowels 24, 39
IV. Consonants 54
V. Compound Vowels 89
VI. Diphthongs; Nasal Vowel Sounds; Nasal Diphthongal Sounds 116
VII. Liquids; General Rules for Pronouncing and Reading French 151

FRENCH READINGS.

XXVI. La Marguerite et l'épi de blé. Section II., with Exercises, &c. Le chien du Louvre, Section I., with Exercises 47
XXVII. Section II., with Exercises 111
XXVIII. La vierge aux ruines. Sections I., II., III., IV., V., with Exercises, &c. 125
XXIX. L'enfance du poète, with Exercises, &c. L'emploi du temps, with Exercises, &c. 143
XXX. Les hirondelles, with Exercises, &c. Le vieux roi et la jeune fille; Sections I., II., with Exercises, &c. 175
XXXI. Sections III., IV., with Exercises, &c. La charité; Section I., with Exercises, &c. 191
XXXII. Section II., with Exercises. Eudoxie; Sections I. II., with Exercises, &c. 207
XXXIII. Section III., with Exercises, &c. 224
XXXIV. Section IV., with Exercises, &c. Le vaisseau en péril, with Exercises, &c. 239

LESSONS IN GEOLOGY.

LVII. Classification of Rocks; Permian Formation 147
LVIII. Lithological Character of the Coal Rocks 179
LIX., LX. On the Coal Measures 209, 243
LXI. Old Red Sandstone, or the Devonian Formation; Lithological Character of the Devonian; Organic Remains of the Devonian; Some Geological Phenomena of the Devonian Period 308

LESSONS IN GREEK.

XLVII. Formation of Words; Verbs; Compounds; Recapitulation 13
XLVIII. Invariable Words 29
XLIX. Syntax; Preliminary Explanations; Subject; Predicate; Agreement; Government 42
L. The Parts of a Simple Sentence considered separately; their Agreement 57
LI. Voices of the Verb 71
LII. Tenses of the Verb 91
LIII. Moods 107
LIV. Enlargement of Simple Sentences 138
LV. Attributives; the Demonstrative Pronouns; the Article 168
LVI. Attributive Words with Substantive Import; Enlargement of the Predicate 201
LVII. Enlargement of the Predicate—*continued*; the Single Accusative 233
LVIII. The Predicate with a Double Accusative 256
LIX. Import and Use of the Dative 293
LX. Import and Use of the Genitive 328
LXI. Syntax of the Prepositions 356
LXII. Interrogative and Imperative Sentences 390

LESSONS IN ITALIAN.

XXXIV., XXXV., XXXVI. Irregular Verbs ending in *ire* long (*continued*) 11, 40, 59
XXXVII., XXXVIII. Irregular Verbs ending in *ere* short; Verbs ending in *cere* 73, 93
XXXIX. Verbs ending in *dere* 122
XL. Verbs ending in *urre*, contracted from *cere*; Verbs ending in *gere* 153
XLI. Verbs ending in *ggere*; Verbs ending in *gliere*; Verbs ending in *guere* 185
XLII. Verbs ending in *lere*; Verbs ending in *mere*; Verbs ending in *pere* 219
XLIII. Verbs ending in *orre*; Verbs ending in *rere*; Verbs ending in *tere*; Verbs ending in *arre*; Verbs ending in *acre* 251
XLIV., XLV., XLVI. Table of Terminations of the Verbs 268, 280, 295
XLVII. Impersonal Verbs; Participle; Adverb 314
XLVIII. Preposition; Conjunction; Interjection 331
XLIX. Syntax of Articles 345
L. Of Nouns, Adjectives, Comparatives and Superlatives, Numerals 353
LI. Of Personal, Possessive, Demonstrative, Relative, and Interrogative Pronouns 378
LII. Of Indefinite Pronouns; of Verbs 393
LIII. Of Participles, Adverbs, and Conjunctions 405

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PAGE

LESSONS IN MORAL SCIENCE.

I. Conscience, or the Moral Faculty; The Moral Faculty, Original and Universal; A Moral Faculty being supposed, whether its Dictates are Uniform; How far all Men are agreed in their Moral Judgments 4
II. Whether Conscience is the same as the Understanding, or a Faculty different from and independent of it; Moral Sense compared with the Taste; Moral Obligation; Supremacy of Conscience 21
III. Whether we always do right by obeying the Dictates of Conscience; Whether there is in the mind a Law or Rule, by which Man judges of the Morality of particular Actions; The Moral Feeling which accompanies every Moral Judgment; Belief in God, as connected with the operation of Conscience 36
IV. Moral Agency, and what is necessary to it; Man a Moral Agent; Man not under a Fatal Necessity 52
V. Man's Direction and Government of his Actions, and his consequent Responsibility; Objections to the Uniform Influence of Motives; Summary View of Liberty 63
VI. The kind of Indifference which has been considered essential to Free Agency; Whether Men are Accountable for their Motives, or whether Desires and Affections which precede Volition have a Moral Character; The Division of Motives into Rational and Animal; Whether Morality belongs to Principles as well as Acts, or is confined to Acts alone..... 86
VII. Moral Habits; Nature of Virtue 100
VIII. Nature of Virtue: Different Hypotheses..... 132
IX. Whether Virtue and Vice belong only to Actions 164
X. The Author of our Being considered in Relation to Moral Science..... 195
XI. Phenomena of the Universe. 227
XII. Duties of Man to the Creator as thus Manifested 260

LESSONS IN PHYSICS, OR NATURAL PHILOSOPHY.

LIII. The Eye considered as an Optical Instrument; Sources of Light, and the Action of Light on Plants; Double Refraction; Polarisation..... 1
LIV. Circular Polarisation 17
LV. Magnetism; Properties of the Magnet; Terrestrial Magnetism; The Compass 33
LVI. Magnetisation and Laws of Magnetic Action ... 49
LVII. Electricity; Measure of Electric Forces 65
LVIII. Action of Electrised Bodies on Bodies in their Natural State; Electrical Machines 81
LIX. Effects produced by the Accumulation of both Electricities..... 97
LX. Various Effects of Statical Electricity; Dynamical Electricity; Voltaic Pile 113
LXI. Dynamic Electricity; Chemical Theory of the Pile; Constant Current Piles 129
LXII. Constant Current Piles—*continued* 145
LXIII. Physiological, Physical, Magnetic and Chemical Effects of the Galvanic Pile or Battery..... 161
LXIV. Magnetic Effects; Galvanometer 177
LXV. Chemical Effects of the Galvanic Pile or Battery 193
LXVI., LXVII., LXVIII., Electro-Dynamics; Electro-Magnetism 212, 225, 241
LXIX. Dynamical Electricity; Phenomena of Induction; Apparatus founded upon Currents of Induction 257
LXX. Phenomena of Induction; Practical Applications of the Galvanic Battery..... 273
LXXI. Dynamical Electricity; Practical Applications of the Galvanic Battery 289
LXXII. Thermo-Electrical Currents 305
LXXIII. General Laws and Velocity of Electrical Currents; Animal Electricity 321
LXXIV. Application of Electricity to Medical Purposes... 337
LXXV. Meteorology; Aerial Meteors, Aqueous Meteors 353
LXXVI., LXXVII., LXXVIII., Luminous Meteors, 369, 385, 401

POETRY.

The Rich Man's Son, and the Poor Man's Son 28
The Sabbath 272
Elijah's Interview 336
After the Battle..... 336

PAGE

LESSONS IN READING AND ELOCUTION.

XXIII. Religion the Guardian of the Soul; Study of Human Nature essential to a Teacher; The Stage; Education..... 135
XXIV. The Press; Greece in 1820; Trying to Please; The Wild Boy; The Mocking Bird 173
XXV. Character of Julius Cæsar; Scrooge and Marley 205
XXVI. Our Control over our Physical Well-being; Classical Learning; Dame Nature's Charms... 287
XXVII. The Lyre; Edmund Burke; Truth..... 303
XXVIII. God, the Creator; The Ursa Major..... 333
XXIX. Excellence of the Holy Scriptures; Crescentius; Rectitude of Character; Address to the Ocean; The Bible; The Downfall of Poland; The Love of Truth 398
XXX. The Scholar's Mission; The Treasure that waxeth not Old; The Young Mariner's Dream; The Victor Angels 411

LESSONS IN SPANISH.

I. Orthography and Pronunciation; Different Methods of Spelling; Sound of Diphthongs and Triphthongs; Syllabication; Accent; Punctuation 61
II. Of the Article and the Noun 76
III. Of the Adjective 95
IV. Degrees of Comparison; of the Pronoun 109
V. Possessive Pronouns 124
VI. Relative Pronouns; Interrogative Pronouns 141
VII. Demonstrative Pronouns; Indefinite Pronouns... 155
VIII. The Verb 171
IX., X., XI., XII. Conjugation 188, 203, 221, 236
XIII. Reflective Verbs; Passive Verbs..... 253
XIV., XV. Irregular Verbs 269, 283
XVI. List of Irregular, Defective, and Impersonal Verbs 297
XVII. List of Verbs with Irregular Past-Participles; of the Adverb, the Conjugation, the Preposition, the Interjection, the Article, the Noun, the Adjective 317
XVIII. List of Numerals, of Pronouns, of Verbs 332
XIX. Use of the Moods and Tenses of Verbs 346
XX. Of the Passive Verb, the Regimen of Verbs, Verbs followed by certain Prepositions, the Use of the Verbs *Ser* and *Estar* 360
XXI. Idiomatic Use of Certain Verbs; of the Adverb 380
XXII. Of the Conjunction 395
XXIII. Of the Preposition and Interjection..... 407

THEORY AND PRACTICE OF TEACHING.

I. Spirit of the Teacher; Responsibility of the Teacher 277
II. Personal Habits of the Teacher 302
III. Literary Qualifications of the Teacher 323
IV. Right Views of Education; Right Modes of Teaching; Pouring-in Process 350
V. Drawing-out Process; the more Excellent Way; Waking-up Mind; Conducting Recitations ... 365
VI. Exciting Interest in Study; Incentives to Study; Emulation; Prizes 372
VII. Proper Incentives; School Government..... 396
VIII. Requisites in the Teacher for Good Government 404

LESSONS IN TRIGONOMETRY.

I. Plane Trigonometry; Solutions of Right-Angled Triangles 326
II. Solutions of Oblique-Angled Triangles 343
III. Trigonometrical Formulæ 363
IV. Spherical Trigonometry; Right-Angled Spherical Triangles..... 376
V. Oblique-Angled Spherical Triangles 388
VI. Trigonometrical Formulæ 409

MISCELLANEA.

Chronology.....16, 32, 128, 144, 176, 240, 272, 288, 304, 336, 384
Arabesques 48
Hints on Spelling..... 64
Hints on Painting 112, 160
Iron *versus* Gold 224

ANSWERS TO CORRESPONDENTS.

16, 32, 48, 64, 96, 192, 208, 224, 256, 272, 288, 320, 336, 368, 400, 412.

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The Popular Educator.

ON PHYSICS, OR NATURAL PHILOSOPHY.—No. LIII.

(*Continued from Vol. V., page* 306.)

THE EYE CONSIDERED AS AN OPTICAL INSTRUMENT.

Insensible part of the Retina.—The retina is not equally sensitive in every part, as is proved by the following experiment of Mariotte. Let two black spots be made on white paper, at a distance of from half an inch to an inch from each other. Then, when the paper is brought very near the eye, let the right eye be fixed upon the left spot without preventing it from seeing the other. If the paper be now slowly withdrawn, the right spot will disappear for a time, but re-appear soon afterwards, if the paper is still further removed. The same thing will happen if the right spot is looked at with the left eye. Mariotte has remarked that at the moment when the spot ceases to be visible, its image is projected upon the insertion of the optic nerve in the interior and lower part of the eye. This insensible part of the eye is called *punctum cæcum*, or the blind point.

Continuance of the Impression on the Retina.—On whirling round a lighted coal with rapidity, we perceive a sort of band of continuous fire. Similarly, the rain which falls in drops appears like liquid threads in the air. These appearances are owing to the fact that the impression produced by objects on the retina remains after the object is removed or replaced by another. The duration of this continuance varies according to the sensibility of the retina and the intensity of the light. M. Plateau, of Brussels, has discovered, by various methods, that it is, on the average, about half a second.

The impression of colours, as well as forms, remain after the removal of the objects that produce them; for, if we divide a circle into sectors, and paint them different colours, on turning it round, the colours mix, and produce the sensation of the colour which would be formed by their mixture. Thus, blue and green produce the sensation of green; yellow and red, that of orange; blue and red, that of violet; and the seven colours of the spectrum, that of white, as is shown by Newton's disc. There are several curious apparatus, the effects of which are explained by the continuance of the impressions upon the retina: such are the thaumatrope, the phenakisticope, the kaleidophone, and Faraday's wheel.

Accidental Images.—If a coloured object be placed upon a dark ground and looked at attentively for some time, the eye soon becomes wearied, and the intensity of the colour grows feeble. On directing the eyes to a white piece of paper or on the ground, we perceive an image of the same form as the object, but of a complementary colour; that is to say, a colour which would form white if it were combined with that of the object. In the case of a green object, the image is red, and *vice versâ*; if the object is yellow, the image is violet. These coloured appearances were remarked by Buffon, who gave them the name of accidental images or colours. Accidental colours continue for a length of time, proportioned to that during which the object was observed, and to the intensity of the light upon it. Generally speaking, they do not disappear gradually and without interruption, but present alternate disappearances and re-appearances. It is well known also that if, after having looked attentively at a coloured object, we close the eyes rapidly, and as firmly as possible, so as to exclude the light, and even screen them from the light by means of a thick piece of cloth over them, the accidental images still appear.

Irradiation is a phenomenon in which white objects, or those of a bright colour, when seen on a dark ground, appear larger than they really are. The reverse takes place with a black object on a white ground. It is thought that irradiation arises from the circumstance that the impression on the retina extends more or less beyond the outline of the image. The effect of irradiation upon the apparent magnitude of the stars is very perceptible, and they may thus appear several times larger than they really are.

Accidental Halo. Contrast of Colours.—Colours which, instead of following the impression of an object, like accidental colours, appear round the object itself, when attentively looked at for some time, are called accidental halos. The impression of the halo is the reverse of that of the object; that is to say, if the object is distinct, the halo is obscure, and *vice versâ*.

Contrast of colours is a reciprocal action which takes place between two colours nearly allied, and by virtue of which each of them assumes the complementary colour of the other. This contrast was observed by M. Chevreul, who profoundly investigated the subject, with a view to ascertain the laws of the phenomenon. It is attributable to the reciprocal action of the accidental halos above mentioned. M. Chevreul found that on red and orange being placed side by side, the red inclined to violet, and the orange to yellow. If the experiment be made upon red and blue, the red inclines to yellow, and the blue to green. With yellow and blue, the yellow passes into orange, and the blue to indigo; and similarly with many other combinations.

The Eye not Achromatic.—It was long the custom of philosophers to attribute to the human eye the property of perfect achromatism; but this notion cannot be admitted without qualification, after the various experiments of Wollaston, Young, Fraünhofer, and Muller. Fraünhofer observed that in a telescope with two glasses, a very fine thread placed inside the instrument is distinctly seen through the eye-piece when the telescope is illuminated with red light only, but ceases to be visible if, without altering the position of the eye-piece, the telescope is illuminated with light of a violet colour. To see the thread again, it is necessary to diminish the distance between the two glasses, much more than is required by the refrangibility of violet light. Hence it is evident that part of the effect is due to the aberration caused by the refrangibility of the eye.

Muller found that on looking with a single eye at a white disc on a black ground, the image is clear when the eye is adapted to the distance of the disc; that is to say, when the image is formed on the retina. But he observed, that if the eye is not adapted to this distance—that is to say, if the image is formed at a distance either in front or at the back of the retina—the disc appears to be surrounded with a very narrow blue band. He concluded, from this and other experiments, that the eye is achromatic as long as the image is received from the focal distance, or the eye is adapted to the distance of the object.

Short Sight and Long Sight.—The usual cause of short-sightedness is a too great convexity of the cornea or crystalline. The eye being then too convergent, the focus, instead of being

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on the retine falls before it, so that the image is confused. This defect is remedied by means of divergent glasses, which, by removing the rays from their common axis, throw back the focus to the retina. The habit of frequently looking at small objects, and making microscopical observations, has a tendency to bring on short-sightedness. This defect is common among young people, but diminishes with advancing years.

Long sight is the opposite of what we have just been considering. People having this affection see distant objects very well, but cannot clearly distinguish those that are near. The defect arises from the insufficient convergence of the eye, in consequence of which the image of objects close at hand is formed beyond the retina. But if the objects be removed to a distance, the image will approach the retina; and when they are at a suitable distance, the image is formed exactly on this membrane and the person sees clearly. Long sight is corrected by means of convergent glasses, which draw together the rays before they enter the eye, in consequence of which, if the convergence be suitably chosen, the image is brought exactly to the retina. Till within a few years it was customary to make use of none but bi-convex glasses for long-sighted people, and bi-concave ones for short-sighted people. Wollaston was the first to propose changing these glasses for concave-convex lenses o and r, fig. 286, arranged in such a manner that their curvature corresponds to that of the eye. These glasses, enabling one to see objects which are far from the optical axis more clearly, are called *periscopic* (from *περισκοπέω*, I look round).

Double Sight is an affection of the eye which causes it to see two objects instead of one. In general, the two images are almost entirely one over the other, and the one is much more apparent than the other. Double sight may result from an inequality in the size of two eyes, but it may also affect a single eye. This last affection is undoubtedly owing to some defect in the formation of the crystalline, or other parts of the eye, which causes the luminous pencil to become forked and form two images on the retina instead of one. A single eye may also be affected with triple sight, but in this case the third image is extremely feeble.

Inability to discern Colours.—Some people are unable to distinguish colours, or at least some particular colours. Such persons can discern the outline and form of objects very well, and also the bright and dark portions, but nothing more. One who was thus affected had painted a landscape, in which the earth, the houses, the trees, and the figures were all blue. On being asked by a friend why he had not given each object its proper colour, he answered that he wished to make the colour of the picture accord with that of the furniture in his room; yet this was red. This defect is sometimes called Daltonism, because Dalton, who has carefully described it, was himself affected with it.

SOURCES OF LIGHT, AND THE ACTION OF LIGHT ON PLANTS.

Various Sources of Light.—The various sources of light are the sun, the stars, heat, chemical combinations, phosphorescence, electricity, and meteorological phenomena. The origin of the light emitted by the sun and stars is unknown. We only know that the inflamed substance with which the sun appears to be surrounded, is gaseous, because the light of that luminary, like that which is emitted by gaseous substances when inflamed, affords no trace of polarisation when viewed through instruments constructed for the purpose of detecting polarisation.

As to light developed by heat, according to M. Pouillet, bodies begin to be luminous in darkness at a temperature of about 1360 or 1400 degrees Fahrenheit, and beyond that, the light they emit is brighter in proportion to the increase of heat. It is through the high temperatures accompanying many chemical combinations that these last occasion a disengagement of light. Such is the cause of the artificial light employed to represent lightning, for, as we have seen, flames are nothing more than gaseous substances heated to such a degree as to become luminous.

As bodies become luminous at a high temperature, calorie seems to be then transformed to light, which would favour the idea, that these two agents ought to be referred to one single cause, especially if we bear in mind that the luminous rays are generally accompanied by calorific rays. But still the identity is not complete, for we know several substances which can be made to give out light in darkness without heat, or at least without any great degree of heat. Bodies of this sort are called phosphorescent, because this property is especially apparent in phosphorus. There are cases in which the phosphorescence is accompanied by a slow chemical action. This is true of phosphorus, certain vegetable or animal substances, as e. g. wood in a state of decomposition, and fish, especially herrings in a putrefied state. In other cases phosphorescence is developed under the influence of a high temperature. For instance, if we heat powdered fluor-spar to about 700 or 900 degrees Fahrenheit, it becomes suddenly luminous and gives forth a bright bluish light. Certain substances become luminous under the influence of solar light. It is thus that the diamond and several other minerals, having been exposed to the rays of the sun, for some time afterwards appear luminous when carried into a dark place. Fluor-spar, diamond, and white marble have the property of acquiring phosphorescence under the action of several successive discharges of a powerful electric battery. Lastly, phosphorescence is very intense in certain insects, especially the glow-worm, which varies its light at will.

In many countries, and especially tropical regions, the sea is often covered with a bright phosphorescent light, caused by zoophytes of extreme minuteness. These animalcules shed so subtle a luminous matter, that Messrs. Quoy and Gaimard, when on a voyage near the equator, having put two of them in a bottle of water, immediately saw the whole mass become luminous. Some philosophers, observing that in many cases the causes of phosphorescence are the same as those which develop electricity, and that feeble electric light strongly resembles that of phosphorescent bodies, infer that phosphorescence is owing to an electric cause.

Action of Light on Vegetables.—Light exercises various kinds of action on vegetables.

1. It is under the influence of the solar rays that the green parts of plants acquire the property of absorbing the carbonic acid in the atmosphere, assimilating the carbon and giving out the oxygen almost pure. In darkness, on the contrary, plants do not give out oxygen, but carbonic acid.

2. It is also under the influence of light that the green substance of vegetables is formed. The less a plant is exposed to the light, the paler it becomes. Humboldt slightly tinged some garden cress with green by exposing it to the brightness of two lamps, and De Candolle obtained a deeper green by using six lamps.

3. The transition from day to night, or from night to day, gives rise to remarkable movements in the leaves and flowers of plants, phenomena popularly described as the sleep and waking of plants. The influence of light is here so apparent, that as soon as the sun appears above the horizon, the sleeping plants awake and open their leaves and petals. By exposing these plants to the artificial light of a sufficient number of lamps, De Candolle succeeded in modifying their habits. He thus saw sensitive plants expand by night, and others open their calixes by day when placed in a dark room.

4. Light also exercises a directing influence upon the branches and roots, the former seeking and the latter avoiding it, at least in many plants. It has been ascertained that all the colours of the spectrum do not exert the same degree of influence upon the branches and roots, but that between blue and violet the greatest intensity of action is produced.

5. Light imparts to vegetables a power of suction. This was demonstrated by the following experiment. Three plants of the same species and the same size were placed in three separate vases containing water, one of which was put in a dark place, the second in a mild light, and the third in the sunshine. The first was found to have imbibed very little water, the second more, and the third by far the most.

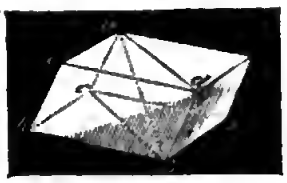
DOUBLE REFRACTION.

Double Refraction is a property by which many crystals present two refracted rays for each one incident on their surface, the consequence of which is, that, on looking at an object through these crystals, it appears doubled. Double refraction was first observed by Bartholin, in 1647, but

Huyghens was the first to give a complete theory of it in 1673. Crystals that have the property of double refraction are called double refracting. They are only those which do not belong to the cubical system. Crystallised bodies belonging to this system, and those without crystallisation, as glass, do not possess the property of double refraction, but they may acquire it accidentally by unequal pressure or sudden cooling after having been heated. Liquids and gases are never double refracting. The phenomenon of double refraction is especially apparent in Iceland spar. In quartz or rock crystal double refraction is very feeble, and to render it perceptible requires a crystal of great thickness and suitable apparatus.

Crystals with one Axis.—In a crystal possessing the property of double refraction there are always one or two directions in which only simple refraction is observed, that is to say, only one image of objects is seen. These directions are called *optical axes* or *axes of double refraction*. This last name, however is inappropriate, for it is precisely in the direction of these axes that double refraction does not take place. *Crystals with one axis* are those which present only one direction in which the light does not become forked, and *crystals with two axes* are those which present two. The crystals with one axis, of which most frequent use is made in optical instruments, are Iceland spar, quartz, and turmalin. Iceland spar has the form of a parallelopiped, the faces of which are inclined at angles of 105 degrees 5 minutes (fig 344). The faces, which are six in

Fig. 344.



number, are rhombi or lozenges, which meet three and three at their obtuse angles at the extremity of a straight line, *a b*, which is *the axis of crystallisation*. Brewster has ascertained the general law that in crystals with one axis, the axis of double refraction always coincides with the axis of crystallisation. The *principal section* of a crystal with one axis is the plane, which passing through the optical axis is perpendicular to a face, whether natural or artificial, of the crystal.

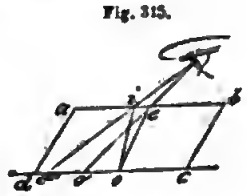
Ordinary and extraordinary Ray.—Of the two refracted rays exhibited by crystals with one axis, one always follows the laws of refraction, and is called *the ordinary ray*.

The other is not generally subject to the laws of refraction, that is to say, the ratio of the sine of the angle of incidence to that of the angle of refraction is not constant, and the plane of refraction does not coincide with that of incidence; hence this ray is called *the extraordinary ray*.

The images corresponding to these rays are also called ordinary and extraordinary.

Figure 345 shows the cause of the rays in this phenomenon.

Fig. 345.



The parallelogram *a b c d* represents a principal section of a parallelopiped of Iceland spar, which being placed upon a sheet of white paper, we look through it at a black point *o*, on the paper. The incident ray setting out from the point *o*, divides into two rays, *o i* and *o s*, which being unequally refracted, on emerging convey two images, *o'* and *o''*, to the eye. If the parallelopiped be turned about on one of its angular points without removing it from the paper, the ordinary image will remain fixed, but the extraordinary image will turn about the other, which shows that the plane of refraction is not in the same position with respect to the plane of incidence, and consequently the extraordinary ray does not conform to the laws of refraction.

Laws of Double Refraction in Crystals with one Axis.—The phenomenon of double refraction in crystals with one axis is subject to the following laws.

1. The ordinary ray, whatever be the plane of incidence, always follows the two general laws of simple refraction.

2. In every section perpendicular to the axis, the extraordinary ray also follows these two laws like the ordinary ray, but its index of refraction is not the same as that of this latter; whence the distinction between *the ordinary index and the extraordinary index*.

3. In every principal section, the extraordinary ray does not follow the second law of refraction, that is to say, the planes of incidence and refraction coincide, but the ratio of the sines of the angles of incidence and refraction is not constant.

4. The velocity of light in a crystal not being the same for the ordinary ray as the extraordinary, the difference of the squares of these two velocities is proportional to the square of the sine of the angle made by the extraordinary ray with the axis.

This last law is the expression of an empirical formula given by Biot, for connecting together the velocities of the two rays. It also results from formulæ, to which Fresnel was conducted by purely theoretical considerations, which have this remarkable peculiarity, that Biot's formula may be deduced from them. Huyghens, who was the first to give a complete theory of double refraction founded on the system of undulations, discovered a very remarkable geometrical construction, by the aid of which one can determine the position of the refracted ray in all its varied situations with regard to the axis, on knowing its incidence; but his theory was not admitted by philosophers till Malus established its accuracy by numerous experiments.

Laws of Double Refraction in Crystals with two Axes.—Crystals with two axes are very numerous. Of this class are the sulphates of nickel, magnesia, barites, potash, and iron, with sugar, mica, and the topaz of Brazil. In these different crystals, the angles of the two axes assume very different values, varying from three to ninety degrees. Fresnel discovered by theory and demonstrated by experiment, that in crystals with two axes, neither of the refracted rays follows the laws of simple refraction, but calling the line which bisects the angle between the two axes *the middle line*, and that which bisects the supplement of this angle *the supplementary line*, he found that in every section perpendicular to the middle line, one of the refracted rays follows the ordinary laws of refraction, and in every section perpendicular to the supplementary line, it is the other ray which follows these laws.

POLARISATION.

Polarisation by Reflection.—Polarisation is a particular modification of the luminous rays, by virtue of which, when once they have been reflected or refracted, they become incapable of further reflection or refraction in certain directions. Polarisation was first discovered in 1810 by Malus, a French philosopher, who died only a few years since. Light is polarised by reflection or refraction. If reflected on a surface of black glass, light is polarised when the reflection takes place at an angle of 35° 25' with the glass. The following are some of the properties of the polarised ray.

1. This ray undergoes no reflection on falling upon a second plate of glass at the same angle of 35° 25', if the plane of incidence on this second plate is perpendicular to the plane of incidence on the former, but it is more or less reflected if incident at other angles.

2. When transmitted through a double refracting prism it only gives one image, if the principal section is parallel or perpendicular to the plane of incidence, while in every other position with respect to this plane, it gives two images more or less bright.

3. It cannot be transmitted through a plate of turmalin whose axis of crystallisation is parallel to the plane of incidence, but on the contrary is more and more easily transmitted, as the axis of the turmalin becomes more and more perpendicular to that plane.

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All bodies have, like glass, the power of polarising light by reflection, but not all with the same completeness, nor at the same angle of incidence. Marble, for instance, completely polarises light, while diamond and common glass only polarise it partially. Of all bodies metals have the smallest polarising power.

Angle and Plane of Polarisation.—The angle of polarisation of a substance is the angle which the incident ray must make with a level and polished surface of this substance, in order that the reflected ray may be polarised as completely as possible. For water this angle is 37° 15', for glass, 35° 25', for quartz 32° 28', for diamond 22°, and 33° 30' for obsidian, a kind of natural black-glass, which polarises light very well.

Sir David Brewster has given the following remarkably simple definition of the angle of polarisation: "The angle of polarisation is the angle of incidence for which the reflected ray is perpendicular to the refracted ray." But this definition is not applicable to light reflected by double refracting crystals. In polarisation by reflection, the plane of reflection in which the light is polarised is called the plane of polarisation. This plane coincides with the plane of incidence, and consequently contains the angle of polarisation. It is in this plane that light which has been once reflected cannot be again reflected at the angle of polarisation, in a plane perpendicular to the first. It is also in this plane that it is not transmissible through turmalin whose axis is parallel to that plane. Every ray, therefore, that is polarised by refraction has a plane of polarisation, that is to say, a plane in which it exhibits the phenomena above mentioned.

Polarisation by Simple Refraction.—When a ray of light which is not polarised falls at the angle of polarisation upon a plate of glass with parallel faces, it is only reflected in part, the other part goes through the plate and is refracted, and the light transmitted is partially polarised in a plane perpendicular to the plane of reflection, and consequently to the plane of polarisation of the light which has been polarised by reflection. Arago observed, also, that the reflected and the refracted pencils contained an equal quantity of polarised light, and that the reunion of these two pencils produces natural light. We may therefore regard ordinary light as formed of two equal pencils, polarised at right angles. As a single plate of glass never completely polarises light, we may employ several, one upon the other, and their successive reflections and refractions will give a more complete result. Glasses so placed are called piles, and are often employed to obtain a pencil of polarised light.

Polarisation by Double Refraction.—Light is polarised by double refraction when it passes through a crystal of Iceland spar or any other double refracting substance. The two pencils, which are distinct on emerging, are both polarised completely, but in different planes, which are perfectly or nearly perpendicular to each other. To prove this, we look through a parallelopiped of Iceland spar at a black spot on a sheet of white paper. To the naked eye there appear two images with the same brightness, but if we interpose a plate of turmalin and turn it about in its own plane, each image will disappear and reappear twice for each revolution of the turmalin, which shows that the two emerging rays are polarised in planes perpendicular to each other. The ordinary image vanishes at the moment when the axis of the turmalin is parallel to the principal section of the surface of incidence, and the extraordinary image at the moment when this axis is perpendicular to the same section; whence we infer that the ordinary pencil is polarised in the plane of the principal section, and the extraordinary pencil in a plane perpendicular to that section.

LESSONS IN FRENCH PRONUNCIATION.—No. I.

ALPHABET OF THE FRENCH LANGUAGE.

1. A *tolerable Pronunciation* of any spoken language may be acquired by *imitating the sounds of that language*, as uttered by a living teacher. But the READING and WRITING of any language cannot thus be learnt. The pupil must bring into requisition something else besides his *imitative powers*, if he would thoroughly comprehend any language. The alphabet of the language to be learnt must be exhibited, *examined*, and MASTERED.

2. An Alphabet is a collection of different characters called *letters*, each of which represents its own peculiar sound. These letters differ from each other in *name*, *form*, *size*, and *sound*. Used as vehicles of thought, they must not only be familiar to the eye, but their *use*, both singly and combined, must be understood.

3. Two objects are to be before the student whilst perusing these lessons book, viz.:—

First.—The acquisition of the correct pronunciation of the various sounds of the letters of the French Alphabet.

Secondly.—To learn how to combine and use these sounds, in order to *read* the French Language easily, intelligibly, and profitably.

4. The first object will be accomplished *by the aid of analogous English sounds*; that is, every sound represented by a letter or combination of letters of the French Alphabet, will be unfolded, analysed and defined, as far as possible, by means of analogous sounds of a letter or continuation of letters of the English Alphabet.

5. The second object will be accomplished by *learning a few brief and simple Rules*, illustrated and enforced by appropriate examples.

6. Diligent attention, patient labour, and A DETERMINATION TO SUCCEED, will enable the learner to overcome every obstacle, and thus make him master of a Language not only exceedingly difficult for foreigners to acquire, but beautiful in itself, and coexistent with the triumphs of civilisation.

7. The student's attention is next directed to an inspection of the French Alphabet.

Capitals.	Small Letters.		Capitals.	Small Letters.
A	a		A	a
B	b		B	b
C	c		C	c
D	d		D	d
E	e	Compare the Al-	E	e
F	f		F	f
G	g	phabet at the left	G	g
H	h		H	h
I	i	of this page, with	I	i
J	j		J	j
K	k	the one on the	K	k
L	l		L	l
M	m	right, which is the	M	m
N	n		N	n
O	o	English Alphabet,	O	o
P	p		P	p
Q	q	and carefully note	Q	q
R	r		R	r
S	s	the difference be-	S	s
T	t		T	t
U	u	tween them.	U	u
V	v		V	v
			W	w
X	x		X	x
Y	y		Y	y
Z	z		Z	z

In the French Alphabet there are only twenty-five letters; it has no letter which corresponds to the English W, though it is occasionally found in French books. It is used only in foreign words, and then prooounced like the English V.

8. The French Alphabet is divided into VOWELS and CONSONANTS.

9. VOWELS.

These *six* letters are called Vowels, viz.:—

a e i o u and y.

10. CONSONANTS.

These *nineteen* letters are called Consonants, viz.:—

b c d f g h j k l m
n p q r s t v x and z.

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II. COMPOUND VOWELS.

They are thus called, because, being united together, each vowel loses its own simple sound, and helps to form another new sound. They form but one syllable, and are consequently pronounced by one emission of the voice.

There are *seven* Compound Vowels, viz. :—

ai au aau ai au oi and ou.

12. DIPHTHONGS.

They are thus called, because, though pronounced as one syllable, yet the sound of both vowel is distinctly heard.

There are *six* Diphthongs, viz. :—

ia ie io ua ue and ui

The following *ten* combinations of THREE SUCCESSIVE VOWELS are also called Diphthongs, viz. :—

iai iau ien oua oue oui uai uei uie and ueu.

These Diphthongs are thus divided into syllables, viz. :—

i-ai i-au i-au ou-a on-e ou-i u-ai u-ei u-ia and u-eu.

They must, however, be pronounced *quickly*, and as *one syllable*.

Sometimes, also, we find FOUR SUCCESSIVE VOWELS in the same word, viz. :—

ouai	in the word	jou-ai,
oueu	„	jon-eur, and
ouée	„	bou-ée.

The *first* example—ouai, is composed of two compound vowels, viz. : ou and ai.

The *second* example—oueu, is also composed of two compound vowels, viz. : ou and eu.

In the *last* example—ouée, the final E is silent, and the three vowels are thus divided, viz. : ou and é.

13. Y.

The vowel Y is frequently found combined with other vowels, but in such combinations it is never used as a diphthong. Its use in combination is peculiar, and will be fully explained hereafter.

14. NASAL VOWEL SOUNDS.

These are certain sounds produced by the combination of the vowels, with the consonants M and N, viz. :

am em im om um ym and
an en in on un yn;

whose sounds will be explained hereafter.

15. NASAL DIPHTHONGAL SOUNDS.

These are certain sounds produced by the combination of *nasal vowel* sounds with a VOWEL, not nasal, before them, viz. :

ian ian ion uan uin ouan and ouin.

16. LIQUIDS.

The following combinations of the consonants are called Liquids, viz. :

ll and gn.

The sounds of these liquids are very common in the French language, and will be explained hereafter.

FRENCH ACCENTS.

17. The constant use of certain marks called ACCENTS in the French language, constitutes a marked peculiarity which cannot escape the attention of the student. Rarely, except in elementary works of the English Language, is the syllable of any given word which requires an emphasis, marked.

18. But it is not so in the French Language; here, accents of various kinds are constantly meeting the eye on every page. One thing, however, must be observed, viz. :—the position of the Accent *does not always and infallibly mark the syllable of a word*, which must receive the stress of voice in common pronunciation.

19. Modern Grammarians have established the following rule, viz. : TO PLACE THE STRESS OF VOICE ON THE LAST PRONOUNCED SYLLABLE OF EVERY WORD.

20. A slight inspection only of the following examples will illustrate the above remarks.

Dé-vo-rer { The first syllable of this word is marked with an accent; must the stress of voice therefore be placed upon the syllable RE? No:—if the rule be applied to this word, the stress of voice falls on the *last* syllable, RER.

It will then be asked, What is the use of this accent? We answer, It *modifies the sound of the vowel over which it is placed.*

Lé-gère-ment { Again :— the word used now as an example, has the same kind of an accent as the word used in the previous example had; and also, it is placed over the same vowel. But it has *another different accent* over the first vowel of the second syllable; and, according to the rule, the stress of voice is not placed either upon the first or second syllable, but upon the last.

This second accent (observe its form and position) only serves *to modify the sound of the vowel over which it is placed.* Sometimes, however, an accent is placed over a vowel of the syllable, which, according to the rule, receives the stress of voice, viz. :—Cé-lé-bri-té.

Bâ-ti-ment { Again, in the word used here as an example, a third, and still different accent is placed over the vowel A. Its presence affects *the sound of that vowel only.* It has nothing whatever to do with the proper accent of that word, as the term *Accent* is understood when applied to words in the English language. As a general rule, the stress of voice is not so strong in the French as in the English language.

21. Accents, as used in the French language, are certain marks differing from each other, and placed over certain *vowels only*, for specific purposes.

22. There are three Accents, viz. :—

called the Acute Accent,
„ Grave „
„ Circumflex „

23. The acute accent, is used *only* over the vowel E, and serves two purposes:

First,—to modify its sound.

Secondly,—to mark the existence of a distinct and final syllable, viz. :—

Dé, Trom-pé,
Pe-tar-dé, Cér-é-mo-nie.

24. The Grave accent, is used *only* over the vowels A, E and U, viz. :—

à, Père, and Où,

and serves two purposes:

First,—to modify the sound of the vowel E.

Secondly,—to distinguish one part of speech from another, viz. :—

à is a Preposition, *a* is a Verb, *là* is an Adverb, *la* is an Article, *où* is an Adverb, *ou* is a Conjunction.

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25. ^ This character, which represents the Circumflex accent, is the union of the Acute and Grave accents, and is placed over each of the Vowels except Y. It indicates that the letter over which it is placed, *has a sound twice as long as it has without it*, viz. :—

Âge, Bête, Bûche, Côte,
Gîte, Mô lée, and Tête.

This accent also indicates the suppression of the letter S, *after the vowel over which it is placed*; thus

Bête, Fête, and Tête

were formerly written

Beste, Feste and Teste.

The S was not sounded, but gave to the preceding vowel that prolonged sound now represented by the circumflex accent. "Cassell's Lessons in French."

This accent also serves to distinguish parts of speech from each other, viz. :

Crû	is a Participle from the Verb Croître.
Cru	is a Noun and Adjective.
Dû	is a Participle from the Verb Devoir.
Du	is an Article and Noun.
Redû	a Participle from the Verb Redevoir.
Sûr	is an Adjective.
Sur	is a Preposition.
Tû	is a Participle from the Verb Taire.
Tu	is a Pronoun.

26. CEDILLA.

Besides the three kinds of accents just enumerated, certain other marks or signs are used, called

Cedilla, Dieresis, Hyphen, and Apostrophe.

ç The Cedilla is a peculiar mark, somewhat resembling a figure 6 inverted, *and placed only under the letter* C, before the vowels A, O, and U, viz. : Ç.

It indicates that the letter C under which it is placed, has the soft sound of the Letter S, viz. :

Çà	pronounced as if printed	Sà.
Deçà	"	Desà.
Façade	"	Fasade.
Façonner	"	Fasonner.
Leçon	"	Lesson.
Reçu	"	Resu.

27. DIERESIS.

¨ The Dieresis consists of two dots, placed *over* the vowels E, I, and U. It shows that the vowel over which it is placed is pronounced separately from the preceding vowel; thus indicating, in reality, a distinct syllable, viz. :

Naïveté	pronounced as if printed	Na-ive-té.
Ouïr	"	Ou-ir.
Poëte	"	Po-ete.

28. HYPHEN.

- The Hyphen is a short horizontal mark, which is used to connect words and syllables, viz. :

A-t-il, Belles-Lettres, Celui-ci, Demi-kilomètre, Fait-on, Suis-je, and Très-rarement.

Its use in connecting syllables is precisely the same as in the English language; that is, when a word is divided, so that a part of it is at the extreme right-hand of a page, and the rest at the extreme left.

29. APOSTROPHE.

' The Apostrophe is like a comma placed at the upper end of letters, instead of at the lower end, or at the bottom on a line with the lower end.

Its use is, to show the elision or cutting off a vowel before words commencing with a vowel or H mute, and is much used in the French language, viz. :—

L' ami	instead of	Le ami.
L' église	"	La église.
L' homme	"	Le homme.
S' il	"	Si il.

30. EUPHONIC T.

This letter is thus called on account of its peculiar position between two parts of speech, viz., the Verb and Pronoun. It does not sound agreeably to the French ear to say

a elle, a il, demande on, etc.

Therefore, to prevent the hiatus of sound between the vowels at the end of the *first* and the beginning of the *second* words in the examples, this Euphonic T is inserted. It is used *only* in asking questions, and then a hyphen is placed both before and after it, viz. :—

a-t-elle? a-t-il? ira-t-on? demande-t-on?
parle-t-il? va-t-on? prouve-t-il?

This letter cannot be translated, because it has no meaning. It is thus used, merely for the sake of euphony.

31. PARENTHESIS AND PUNCTUATION.

In the French language, the

Parenthesis () Comma , Semicolon ; Colon : Period . Mark of Interrogation ? Mark of Exclamation ! Dash — and Quotation " "

are the same, and used for the same purposes, as in the English language.

32. ASTERISKS.

The Asterisks in the French language, are also the same, and used for the same purposes, as in the English language, viz. :—

* † ‡ § ‖ ¶

LESSONS IN MORAL SCIENCE.—No. I.

CONSCIENCE, OR THE MORAL FACULTY.

As all men, when reason is developed, have a faculty by which they can discern a difference between objects of sight which are beautiful and those which are deformed, so all men possess the power of discerning a difference between actions, as to their moral quality. The judgment thus formed is immediate, and has no relation to the usefulness or injuriousness to human happiness, of the objects contemplated.

Whatever difference of opinion may exist respecting the origin of this faculty, it is universally admitted that men, in all ages and countries, have judged some actions to be good and deserving of approbation, while they have judged others to be bad and of ill desert.

In all languages, we find words expressive of the ideas of moral excellence, and moral evil. In the laws and penalties established in all ages throughout the world, it is evidently implied that some actions ought to be done, and others avoided. In cases of flagrant injustice or ingratitude, all men, of every country and of every age, agree in their judgment of their moral evil. There is, in regard to such actions, no more difference in the judgment of men, than respecting the colour of grass, or the taste of honey. If any man does not perceive grass to be green, or honey to be sweet, we do not thence conclude that men's bodily senses are not similarly constituted, but that the organs of the individual who does not see and taste as other men do, are defective, or depraved by disease.

To determine whether all men have one original moral faculty, the case proposed for their moral judgment should be simply good or evil. For a complex act, in which there is something good and something evil, or rather where there must be an accurate weighing of motives in order to ascertain the quality of the action, is not a proper test as to the existence of a uniformity of moral judgment in men. Therefore,

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the historical fact adduced by Dr. Paley,* from the history of Valerius Maximus, is not at all suited to his purpose; because the case is very complex, and one on which it is difficult to determine at first view, what the true moral character of the action is. The facts, as related by him, are as follows: The father of Caius Toranius had been proscribed by the Triumvirate. Caius Toranius—coming over to the interests of that party—discovered his father's place of concealment to the officers who were in pursuit of him, and gave them, withal, a description of his person by which they might distinguish him. The old man, more anxious for the safety and fortunes of his son than for the little that might remain of his own life, began immediately to inquire of the officers whether his son were well, and whether he had done his duty to the satisfaction of the generals. 'That son (replied one of the officers), so dear to thy affections, has betrayed thee to us; by his information thou art apprehended, and diest.' With this, the officer struck a poniard to his heart, and the unhappy parent fell, affected not so much by his fate, as by the means to which he owed it." Now, the question is, if this story were related to the wild boy caught some years ago in the woods of Hanover, or to a savage without experience and without instruction, cut off in his infancy from all intercourse with his species, and consequently under no possible influence of example, authority, education, sympathy, or habit, whether or not such a one would feel upon the relation any degree of that sentiment of disapprobation of Toranius's conduct which we feel.

In our judgment, such a case would afford no criterion by which to determine whether men possess constitutionally a *moral sense*. For, in the first place, the trial would be no better than if the question were proposed to a child two years old, in whose mind the moral faculty is not yet developed. A human being, arrived at adult age without instruction or communication with others, would be—as it regards to the mind—in a state differing very little from that of infancy. It is not held that the moral sense will be exercised without the usual means by which human faculties are developed. If an organical defect in the brain should prevent the intellectual faculties from coming into exercise, the unhappy individual thus deprived of reason would prove nothing in regard to the operations of reason where it is developed. So, also, if a human being were brought up from early infancy in a dark dungeon, and if no information were communicated to him, the mental faculties would not be developed, and it would be absurd to have recourse to such a one to ascertain what faculties belong to the human mind. The same remark will apply to the case of the wild boy, referred to by Dr. Paley; and also, though in an inferior degree, to savages of the most degraded class.

Let it then be fairly understood what it is which is asserted in regard to conscience, as an original, universal faculty. It is, that every human mind, when its faculties have been developed, and have arrived at some degree of maturity, discerns a quality in certain actions which is termed moral; that is, it intuitively perceives that some actions are right and some wrong.

Another objection to the historical fact adduced by Dr. Paley, is, that it presents to the mind, not a case of simple, unmixed good or evil, but a complex case, in which—before a judgment can be formed of the action of the son—it must be decided whether a man ought to be governed by a regard to the welfare of a parent, or to the public good. If the son believed that the party in pursuit of his father was promoting the public good, he might feel that he ought to be governed by this rather than by filial affection. Here, then, we have presented a complex and difficult case in morals, about which men would be very apt to differ; and we are to determine whether all men—even those totally uneducated—would view it in the same light.

To render the case a suitable one to be a test of the question under consideration, it should be supposed that the father was acting in conformity with the strictest principles of rectitude; that his life was sought by wicked men, aiming not at the good of the commonwealth but its destruction; and that the son, in betraying the place of his concealment, was actuated by mercenary motives, or by unjust and unnatural dislike to a good parent. If a case like this were presented to a thousand persons, from as many different parts of the world, there would be but one judgment and one feeling; all would judge the conduct of the son to be blameable. Different degrees of moral disapprobation would be felt by those whose moral faculty was in a cultivated state; but there would be no difference in the opinion entertained of his conduct. All would feel disapprobation, accompanied by a desire for the punishment of the offender. It is found that savages appear to have but an obscure exercise of conscience, but in proportion as their minds are cultivated, this faculty becomes more manifest, and operates more forcibly.

* In the chapter of his Moral Philosophy, under the head "The Moral Sense."

THE MORAL FACULTY, ORIGINAL AND UNIVERSAL.

If conscience were not an original faculty, enabling us to form a conception of moral qualities, man could never acquire such an idea by any other means. The opinion, therefore, that moral feelings are merely the effect of instruction and education, is erroneous. For every class of simple ideas there must be an appropriate faculty, without which these ideas can never be acquired. In regard to the bodily senses, this is too evident to be called in question. Without the organ of vision, the simple idea of light and colours could never be communicated by any instructions; without the organ of hearing, no idea of sound can be conveyed; and so of the other senses. And it is equally true of that knowledge which is acquired by what some have called the internal senses. If there were in man no such faculty as taste, by which beauty is perceived, no idea of the beautiful could possibly be communicated. A horse has no perception of the beauty of a scene which perhaps enchants his rider, even though the animal sees all the objects with equal distinctness. So it is in regard to moral qualities. There must be an original faculty to give us the simple idea which we have of morality; otherwise the idea of virtue or vice could never have entered the human mind, and the feelings of moral obligation, of which all men are conscious, would never have been felt.

We are aware that those who advocate the utilitarian scheme, resolve all our ideas of morality and moral obligation into the mere principles of benefit or injury, apprehended to be connected with each action. Dr. Paley informs us, that the subject continued to be involved in impenetrable mystery, until he took this view of it.

It is deemed useless to argue this point; it cannot be decided by reasoning. The appeal must be made to the consciousness of every man.

If any one persists in declaring that he sees no evil in any action but as it is evidently detrimental to human happiness, nothing can be said in the way of argument to alter convictions derived from his own consciousness. All that is proper to be said is, that the mind of such a person is differently constituted from that of most men; or rather that an impartial examination of this subject has not been made. It is recommended to such persons carefully to scrutinise the exercises of their own minds; they will perceive that the idea of virtue or moral good is entirely distinct from that of mere utility. There is, indeed, a connexion between these two things which is very intimate, and this seems to have misled many in their judgments. Virtuous conduct leads to happiness, and is always beneficial; yet our idea of its moral character is not derived from this consideration, but from the nature of the action itself.

A MORAL FACULTY BEING SUPPOSED, WHETHER ITS DICTATES ARE UNIFORM?

One of the strongest objections which has been brought against the doctrine laid down is, that among men of different countries, and of entirely different education, there is no agreement in their judgments respecting the morality or immorality of the same actions. Whereas, it is alleged, that if such a faculty were originally a part of man's constitution, there would as certainly be uniformity, as in the perception of objects by the external senses. Now, if the dictates of conscience in men of different countries do so much differ, does it not show that the moral feelings of men are just what education makes them? And what is gained by maintaining the existence of a moral faculty, as part of man's original constitution?

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It will, we think, be admitted, that in all countries and conditions in which men have been found, there exists a perception of a difference in the moral character of actions; that is, some things are accounted wrong, which ought not to be done, and some right which ought to be done.

Again, it has never been pretended as being a matter of fact, that between men of different countries there is a total difference in the opinions entertained respecting what is right and what is wrong. A few cases only of difference are alleged, in which this discrepancy is observed; but in regard to those actions which are reckoned good or evil, there is a general agreement. As to those in which there seeme to be a fundamental difference, an explanation will be given hereafter. No nation, or tribe, or class of mankind has ever held that it is a virtuous and proper thing to do injury to men, or that there is no more harm in taking away life than in preserving it. It has never been held that ingratitude—though everywhere common in practice—is a commendable thing; or that deceit and fraud are as praiseworthy as honesty and fair dealing.

There is in every country a difference made in the estimation of the character of men, derived from the course of their conduct. Some men are reckoned good in the public estimation, while others are considered wicked; the former obtain esteem, the latter are despised. That course of conduct which secures a good reputation, does not in any country consist of actions which we consider wicked, but of actions which in all countries are considered praiseworthy; and men have never obtained a bad character by a course of good behaviour.

It is also important to observe, that the conduct of a people is not a fair test of the internal state of the mind, as it relates to morals. We know that individuals often pursue a course of conduct, which in their serious moments they condemn. Yet the power of temptation, and the habit of indulgence are such, that notwithstanding the convictions of conscience, they continue in a course of evil-doing. It would be a very inconclusive inference to determine from their habitual conduct, that they acted in accordance with the dictates of conscience. And what is true of individuals, may be true of nations and tribes. Those customs which they have received from their forefathers, may not meet with the approbation of their moral sense, and yet such is the force of an established custom, that they go on in the way in which they were brought up.

But a more satisfactory explanation of those facts, in which men seem conscientiously to go contrary to the fundamental principles of morals, is, that the principle on which they act is correct, but through ignorance or error they make an erroneous application of it.

When parents murder their own female children—a thing very customary in China—it is on the principle that they will be subject to more misery than happiness in the world; and therefore it is doing them a favour. Here, the general principle is correct—that parents should consult the best interests of their offspring—but the mistake is in the application. The same may be said of the practice of exposing aged parents, when they become incapable of enjoying the world.

As to those acts of cruelty which the Pagans perform in their religious services (the wife committing herself to the flames with the body of her deceased husband, children voluntarily thrown into the Ganges, or persons devoting their own lives by falling under the car of Juggernaut), they are performed on the principle that what God requires, or what pleases him, or what will secure happiness for ourselves or friends, should be done. It is true that the will of God should be obeyed, whatever sacrifice he may require; their error is in thinking that such sacrifices are required by Him.

HOW FAR ALL MEN ARE AGREED IN THEIR MORAL JUDGMENTS.

As the subject of morals is very extensive, and particular cases may be complicated, and as men are not only ignorant, but prejudiced by the errors received in their education, it is no more wonderful that they should adopt different opinions on these subjects than on other matters. That, however, which is true in regard to every department of human knowledge, is doubtless true in regard to the science of morals. There are certain self-evident truths, which are intuitively perceived by every one who has the exercise of reason, as soon as they are presented to the mind. In regard to these fundamental truths, there has never been any difference of opinion. It is not meant that all men distinctly think of these primary truths in morals; for many are so inattentive, or so much occupied with sensible objects, that they can scarcely be said ever to reflect on the subject of moral duty. But let an act of manifest injustice be performed before their eyes, and among a thousand spectators there will be but one opinion, and but one feeling. If a strong man, for example, violently takes away the property of one weaker than himself, and for no other reason than because he covets it, all men will condemn the act. So, if any one who has received from another great benefits, not only refuses to make any grateful return, but, on the contrary, returns evil for good, all men will agree in judging his conduct to be wrong. All intuitively discern that for a ruler to punish the innocent and spare the guilty, is morally wrong. It is not true, in fact, that there is no agreement among men as to the fundamental principles of morals. Their judgments on these points are as uniform as on the axioms of mathematics; as in their agreement that the starry firmament is grand and beautiful; yea, as uniform as concerning the greenness of the grass, or the varied colours of the rainbow.

Mr. Locke, in his zeal to disprove the existence of innate truths, attempts to render uncertain some of these first truths of morals.

When we go beyond these first principles, we may expect to find men falling into grievous error respecting moral duty; and this often appears in their application of general principles to particular cases. Most men either do not reason at all, or reason badly, and draw from sound principles incorrect conclusions. For the most part, they receive implicitly what they have been taught; or they are governed in their opinions by the common sentiment; or they adopt as true what is most for their interest, or most agreeable to their feelings. And as men are often under the influence of feelings or passions which produce perturbation of mind, and so bias the judgment, it is easy to see how errors of judgment respecting moral conduct, in many cases, may spring up. And yet it is true, that there are primary truths in morals, in which all men agree, so soon as they are presented to the mind. As in other cases, by pursuing a course of sophistical reasonings, conclusions may be arrived at which are contradictory to these first principles, and this will produce perplexity; or even a kind of speculative assent may be yielded to such conclusions of ratiocination; but whenever it is necessary to form a practical judgment, the belief of intuitive truths must prevail. Our assent in these cases is not a matter of choice, but of necessity. Bishop Berkeley thought he had demonstrated that there was no external world; and many others thought there was no flaw in his reasoning: but all these speculative sceptics were, nevertheless, practical believers in the real existence of external objects. Atheistical and infidel philosophers have often endeavoured to prove that there is no intrinsic difference between right and wrong, and some of them probably persuaded themselves that this opinion was true; but these very men, when an act of great injustice towards themselves or friends was committed, could not but feel that it was morally evil; and when they saw an act of disinterested benevolence performed, they could not but approve it as morally good.

LESSONS IN ALGEBRA.—No. XXI.

(*Continued from Vol. V., page* 391.)

POWERS OF ROOTS.

In the preceding examples of *roots*, the numerator of the fractional index has been a *unit*. There is another class of quantities, the numerators of whose indices are *greater* than 1, as $b^{\frac{3}{4}}$, $c^{\frac{2}{3}}$, etc. These quantities may be considered either as *powers of roots*, or *roots of powers*.

N.B.—In all instances, when the root of a quantity is denoted by a fractional index, the *denominator*, like the figure over the radical sign, expresses the *root*, and the *numerator* the *power*. Thus, $a^{\frac{1}{3}}$ denotes the *cube* root of the *first* power

of a, i.e. that a is to be resolved into three *equal factors*; for $a^{\frac{1}{3}} \times a^{\frac{1}{3}} \times a^{\frac{1}{3}} = a$. On the other hand, $c^{\frac{3}{4}}$ denotes the *third* power of the *fourth* root of c, or the *fourth* root of the *third* power. One expression is *equivalent* to the other.

1. What is $a^{\frac{4}{5}}$ equal to? 2. What is $x^{\frac{2}{3}}$ equal to?
3. What is $y^{\frac{3}{4}}$ equal to? 4. What is $b^{\frac{1}{5}}$ equal to?
5. Write the fifth root of the fourth power of a.
6. Write the seventh power of the ninth root of d.

The value of a quantity is not altered, by applying to it a fractional index whose numerator and denominator are equal.

Thus, $a = a^{\frac{2}{2}} = a^{\frac{3}{3}} = a^{\frac{n}{n}}$. For the denominator shows that a is resolved into a certain number of factors; and the numerator shows that all these factors are multiplied together in $a^{\frac{n}{n}}$.

On the other hand, when the numerator of a fractional index becomes equal to the denominator, the expression may be rendered more simple by *rejecting* the index.

Instead of $a^{\frac{n}{n}}$, we may write a.

The index of a power or root may be exchanged for any other index of the same value.

Instead of $a^{\frac{2}{3}}$ we may put $a^{\frac{4}{6}}$.

For in the latter of these expressions, a is supposed to be resolved into *twice* as many factors as in the former; and the numerator shows that *twice* as many of these factors are to be multiplied together. Hence the value is not altered.

From the preceding article it will be easily seen, that a fractional index may be expressed in *decimals*.

7. Thus $a^{\frac{1}{2}} = a^{\frac{5}{10}}$, or $a^{0.5}$; that is, the square root is equal to the fifth power of the tenth root.

8. Express $a^{\frac{1}{4}}$ in decimals. 9. Express $a^{\frac{3}{4}}$ in decimals.
10. Express $a^{\frac{1}{3}}$ in decimals. 11. Express $a^{\frac{2}{3}}$ in decimals.
12. Express $a^{\frac{11}{4}}$ in decimals.

In many cases, however, the decimal can be only an *approximation* to the true index.

13. Thus $a^{\frac{1}{3}} = a^{0.3}$ nearly, or $a^{0.3333}$ more nearly.

In this manner, the approximation may be carried to any degree of exactness which is required.

14. Express $a^{\frac{4}{5}}$ in decimals. 15. Express $a^{\frac{11}{4}}$ in decimals.

N. B. These decimal indices form a very important class of numbers, called *logarithms*.

EVOLUTION.

The process of *resolving* quantities into *equal factors*, is called *Evolution*.

In *subtraction*, a quantity is resolved into *two parts*.
In *division*, a quantity is resolved into *two factors*.
In *evolution*, a quantity is resolved into *equal factors*.

Evolution is the opposite of involution. The former is finding a *power* of a quantity, by multiplying it into itself. The other is finding *a root*, by resolving a quantity into equal factors. A quantity is resolved into any number of equal factors, by dividing its *index* into as many *equal parts*.

From the foregoing principles we deduce the following

GENERAL RULE FOR EVOLUTION.

Divide the index of the quantity by the number expressing the root to be found Or,

Place the radical sign belonging to the required root over the given quantity.

If the quantities have co-efficients, *the root of these must be extracted and placed before the radical sign or quantity.* Thus,

To find the square root of d^4, divide the index 4 by 2, i. e. $d^{\frac{4}{2}} = d^2$. So the cube root of d^6, is $d^{\frac{6}{3}} = d^2$.

Obs.—From the manner of performing evolution it is evident, that the plan of denoting roots by *fractional* indices, is derived from the mode of expressing powers by *integral* indices.

1. Required the cube root of a^6. Ans. a^2.
2. Required the cube root of a or a^1. Ans. $a^{\frac{1}{3}}$, or $\sqrt[3]{a}$.
For $a^{\frac{1}{3}} \times a^{\frac{1}{3}} \times a^{\frac{1}{3}}$, or $\sqrt[3]{a} \times \sqrt[3]{a} \times \sqrt[3]{a} = a$.
3. Required the fifth root of ab.
4. Required the nth root of a^2.
5. Required the seventh root of $2d-x$.
6. Required the fifth root of $(a-x)^3$.
7. Required the cube root of $a^{\frac{1}{2}}$.
8. Required the fourth root of a^{-1}.
9. Required the cube root of $a^{\frac{2}{3}}$.
10. Required the nth root of x^m.
11. Required the third root of a^n.
12. Required the fourth root of x^n.
13. Required the second root of x^n.
14. Required the fifth root of d^3.
15. Required the eighth root of a^3.

The rule in the preceding article may be applied to every case in evolution. But when the quantity whose root is to be found, is composed of *several factors*, there will frequently be an advantage in taking the root of each of the factors *separately*.

This is done upon the principle that *the root of the product of several factors is equal to the product of their roots.*

Thus $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$. For each member of the equation if raised to any power, will give the same result.

When, therefore, a quantity consists of several factors, we may either extract the root of the whole together, or we may find the root of the factors separately, and then multiply them into each other.

16. The cube root of xy is either $(xy)^{\frac{1}{3}}$, or $x^{\frac{1}{3}}y^{\frac{1}{3}}$.
17. Required the fifth root of $3y$.
18. Required the sixth root of abh.
19. Required the cube root of $8b$.
20. Required the nth root of $x^n y$.

The root of a fraction is equal to the root of the numerator divided by the root of the denominator.

21. Thus the square root of $\frac{a}{b} = \frac{a^{\frac{1}{2}}}{b^{\frac{1}{2}}}$. For $\frac{a^{\frac{1}{2}}}{b^{\frac{1}{2}}} \times \frac{a^{\frac{1}{2}}}{b^{\frac{1}{2}}} = \frac{a}{b}$.

22. Required the nth root of $\frac{a}{b}$.

23. Required the square root of $\frac{x}{ay}$.

Signs.—(1.) *An odd root of any quantity has the same sign as the quantity itself.*
(2.) *An even root of a positive quantity is ambiguous.*
(3.) *An even root of a negative quantity is impossible.*

But an *even* root of a *positive* quantity may be either *positive* or *negative*. For the quantity may be produced from the one, as well as from the other.

Thus the square root of a^2 is $+a$, or $-a$.

An even root of a positive quantity is, therefore, said to be *ambiguous*, and is marked with the sign $\pm$. Thus the square root of $3b$ is $\pm\sqrt{3b}$. The 4th root of x is $\pm x^{\frac{1}{4}}$.

The ambiguity does not exist, however, when from the nature of the case, or a previous multiplication, it is known whether the power has actually been produced from a *positive* or from a *negative* quantity.

But no *even* root of a *negative* quantity can be found.

The square root of $-a^2$ is neither $+a$ nor $-a$.

For $+a \times +a = +a^2$. And $-a \times -a = +a^2$ also.

An *even* root of a *negative* quantity is, therefore, said to be *impossible* or *imaginary*.

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The methods of extracting the roots of *compound* quantities need not be considered here. But there is one class of them, the squares of *binomial* and *residual* quantities, which it will be proper to attend to in this place. The square of $a + b$, for instance, is $a^2 + 2ab + b^2$, two terms of which, a^2 and b^2, are complete powers, and $2ab$ is twice the product of a into b, that is, the root of a^2 into the root of b^2.

Whenever, therefore, we meet with a quantity of this description, we may know that its square root is a binomial; and this may be found by taking the root of the two terms which are complete powers, and connecting them by the sign +. The other term disappears in the root. Thus, to find the square root of $x^2 + 2xy + y^2$, take the root of x^2, and the root of y^2, and connect them by the sign +. The binomial root will then be $x + y$.

In a *residual* quantity, the double product has the sign — prefixed, instead of +. The square of $a - b$, for instance, is $a^2 - 2ab + b^2$. And to obtain the root of a quantity of this description, we have only to take the roots of the two complete powers, and connect them by the sign —. Thus the square root of $x^2 - 2xy + y^2$, is $x - y$. Hence,

To extract the square root of a *binomial* or *residual*.

Take the roots of the two terms which are complete powers, and connect them by the sign which is prefixed to the other term.

1. To find the root of $x^2 + 2x + 1$.
 The two terms which are complete powers, are x^2 and 1.
 The roots are x and 1. Then $x + 1$. Ans.
2. Find the square root of $x^2 - 2x + 1$.
3. Find the square root of $a^2 + a + \frac{1}{4}$.
4. Find the square root $x^2 + \frac{2}{3}x + \frac{1}{9}$.
5. Find the square root of $a^2 + ab + \frac{b^2}{4}$.
6. Find the square root of $a^2 + \frac{2ab}{c} + \frac{b^2}{c^2}$.

A root whose value cannot be exactly expressed in numbers is called a SURD, *or irrational quantity.*

Thus $\sqrt{2}$ is a surd, because the square root of 2 cannot be expressed in numbers with perfect exactness.

In decimals, it is 1·41421356 nearly.

Every quantity which is not a *surd* is said to be *rational*.

By RADICAL QUANTITIES is meant, all quantities which are found under the *radical sign*, or *which have a fractional index*.

REDUCTION OF RADICAL QUANTITIES.

CASE I. To reduce a *rational* quantity to the form of a *radical* without altering its value.

Raise the quantity to a power of the same name as the given root, and then apply the corresponding radical sign or index.

1. Reduce a to the form of the nth root.
 The nth power of a is a^n.
 Over this, place the radical sign, and it becomes $\sqrt[n]{a^n}$.
 It is thus reduced to the form of a radical quantity, without any alteration of its value. For $\sqrt[n]{a^n} = a^{\frac{n}{n}} = a$.
2. Reduce 4 to the form of the cube root.
3. Reduce $3a$ to the form of the 4th root.
4. Reduce $\frac{1}{2}ab$ to the form of the square root.
5. Reduce $3 \times (a - x)$ to the form of the cube root.
6. Reduce a^2 to the form of the cube root.

N.B. In cases of this kind, where a *power* is to be reduced to the form of the nth root, it must be raised to the nth power, not of the *given letter*, but of the *power* of the letter.

Thus, in the 6th example, a^6 is the cube, not of a, but of a^2.

7. Reduce a^3b^4 to the form of the square root.
8. Reduce a^m to the form of the nth root.

CASE II. To reduce quantities which have *different indices* to others of the same value having a *common index*.

(1.) *Reduce the indices to a common denominator.*

(2.) *Raise each quantity to the power expressed by the numerator of its reduced index.*

(3.) *Take the root denoted by the common denominator.*

9. Reduce $a^{\frac{1}{2}}$ and $b^{\frac{2}{3}}$ to a common index.
 1st. The indices $\frac{1}{2}$ and $\frac{2}{3}$ reduced to a common denominator are $\frac{3}{6}$ and $\frac{4}{6}$.
 2nd. The quantities a and b raised to the powers expressed by the two numerators are a^3 and b^4.
 3rd. The root denoted by the common denominator is the 6th. The answer, then, is $(a^3)^{\frac{1}{6}}$ and $(b^4)^{\frac{1}{6}}$.
 The two quantities are thus reduced to a common index, without any alteration in their values.
 For $a^{\frac{1}{2}} = a^{\frac{3}{6}}$, which $= (a^3)^{\frac{1}{6}}$.
 And universally, $a^{\frac{1}{n}} = a^{\frac{m}{mn}} = (a^m)^{\frac{1}{mn}}$.
10. Reduce $a^{\frac{1}{2}}$ and $bx^{\frac{2}{3}}$ to a common index.
 Ans. $a^{\frac{3}{6}}$ and $(bx)^{\frac{4}{6}}$, or $(a^3)^{\frac{1}{6}}$ and $(b^4x^4)^{\frac{1}{6}}$.
11. Reduce $a^{\frac{1}{n}}$ and $b^{\frac{1}{m}}$ to a common index.
12. Reduce $x^{\frac{1}{n}}$ and $y^{\frac{1}{m}}$.
13. Reduce $2^{\frac{1}{3}}$ and $3^{\frac{1}{4}}$.
14. Reduce $(a + b)^{\frac{1}{2}}$ and $(x - y)^{\frac{2}{3}}$
15. Reduce $a^{\frac{1}{2}}$ and $b^{\frac{1}{3}}$.
16. Reduce $x^{\frac{1}{3}}$ and $b^{\frac{1}{4}}$.

CASE III. To reduce a quantity to one with a *given index*.

Divide the index of the quantity by the given index, place the quotient over the quantity, and set the given index over the whole.

This is merely resolving the original index into two factors.

17. Reduce $a^{\frac{1}{2}}$ to one with the index $\frac{1}{4}$.
 $\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = \frac{2}{1}$.
 This is the index to be placed over a, which then becomes $a^{\frac{2}{1}}$; and the given index set over this, makes it $(a^{\frac{2}{1}})^{\frac{1}{4}}$, the answer
18. Reduce $a^{\frac{1}{2}}$ and $x^{\frac{2}{3}}$ to others with the common index $\frac{1}{6}$.
 $2 \div \frac{1}{6} = 2 \times 3 = 6$, the first index.
 $\frac{2}{3} \div \frac{1}{6} = \frac{2}{3} \times 3 = \frac{6}{3}$, the second index.
 Therefore $(a^6)^{\frac{1}{6}}$ and $(x^4)^{\frac{1}{6}}$ are the quantities required.
19. Reduce $4^{\frac{1}{2}}$ and $3^{\frac{1}{3}}$ to others with the common index $\frac{1}{6}$.
20. Reduce $x^{\frac{1}{3}}$ and $y^{\frac{1}{4}}$ to others with the common index $\frac{1}{12}$.
21. Reduce $a^{\frac{1}{2}}$ and $b^{\frac{1}{3}}$ to others with the common index $\frac{1}{6}$.
22. Reduce $c^{\frac{1}{3}}$ and $d^{\frac{1}{4}}$ to others with the common index $\frac{1}{12}$.
23. Reduce $a^{\frac{1}{m}}$ and $b^{\frac{2}{m}}$ to others with the common index $\frac{1}{n}$.
24. Reduce $a^{\frac{1}{2}}$, $b^{\frac{1}{3}}$, and $c^{\frac{1}{4}}$ to others with the common index $\frac{1}{12}$.

CASE IV. To reduce a radical quantity to its *most simple terms*; *i. e.* to remove a factor from under the radical sign.

Resolve the quantity into two factors, one of which is an exact power of the same name with the root; find the root of this power, and prefix it to the other factor, with the radical sign between them.

This rule is founded on the principle, that the root of the *product* of two factors is equal to the product of their roots.

It will generally be best to resolve the radical quantity into such factors, that one of them shall be the *greatest* power which will divide the quantity without a remainder.

N. B. If there is no exact power which will divide the quantity, the reduction cannot be made.

25. Remove a factor from $\sqrt{8}$.
 The greatest square which will divide 8 is 4.
 We may then resolve 8 into the factors 4 and 2. For $4 \times 2 = 8$.
 The root of this product is equal to the product of the roots of its factors; that is, $\sqrt{8} = \sqrt{4} \times \sqrt{2}$.
 But $\sqrt{4} = 2$. Instead of $\sqrt{4}$, therefore, we may substitute its equal 2. We then have $2 \times \sqrt{2}$, or $2\sqrt{2}$.

26. Reduce $\sqrt{a^2x}$. Ans. $\sqrt{a^2} \times \sqrt{x} = a \times \sqrt{x} = a\sqrt{x}$.
27. Reduce $\sqrt{18}$ to its simplest form.
28. Reduce $\sqrt[3]{64b^3c}$.
29. Reduce $\sqrt[4]{\frac{a^3b}{c^4d}}$.
30. Reduce $\sqrt[n]{a^nb}$.
31. Reduce $(a^3 - a^2b)^{\frac{1}{2}}$.
32. Reduce $(5ta^4b)^{\frac{1}{2}}$.
33. Reduce $\sqrt{98a^2x}$.
34. Reduce $\sqrt[3]{a^3 + a^3b^3}$.

Case V. To introduce a *co-efficient* of a radical quantity under the radical sign.

Raise the co-efficient to a power of the same name as the radical part, then place it as a factor under the radical sign.

35. Thus, $a\sqrt[n]{b} = \sqrt[n]{a^nb}$.

For $a = \sqrt[n]{a^n}$ or $a^{\frac{n}{n}}$. And $\sqrt[n]{a^n} \times \sqrt[n]{b} + \sqrt[n]{a^nb}$.

36. Reduce $a(x-b)^{\frac{1}{2}}$ to the form of a radical.

Ans. $(a^2x - a^2b)^{\frac{1}{2}}$.

37. Reduce $2ab\,(2ab^2)^{\frac{1}{2}}$.
38. Reduce $\frac{a}{b}\left(\frac{b^2c}{a^2+b^2}\right)^{\frac{1}{2}}$.
39. Reduce $2\sqrt{2}$.
40. Reduce $4b^3\sqrt{c}$.

EXAMPLES FOR PRACTICE.

1. Reduce $5\sqrt{6}$ to a simple radical form.
2. Reduce $\frac{1}{2}\sqrt{5a}$ to a simple radical form.
3. Reduce $5^{\frac{1}{2}}$ and $6^{\frac{1}{3}}$ to others with the common index $\frac{1}{6}$.
4. Reduce $a^{\frac{1}{2}}$ and $a^{\frac{1}{3}}$ to others with the common index $\frac{1}{6}$.
5. Reduce $\sqrt{98}$ to its simplest form.
6. Reduce $\sqrt{243}$ to its simplest form.
7. Reduce $\sqrt[3]{54}$ to its simplest form.
8. Reduce $7\sqrt{80}$ to its simplest form.
9. Reduce $9\sqrt[3]{81}$ to its simplest form.
10. Reduce $\sqrt{x^3 + ax^2}$ to its simplest form.
11. Reduce $\sqrt{198a^2x}$ to its simplest form.
12. Reduce $\sqrt{x^3 - a^2x^2}$ to its simplest form.

LESSONS IN ITALIAN GRAMMAR.—No. XXXIV.

III.

Calére, to matter.

INFINITIVE MOOD.

Present: *Calére*, to matter.
Past Participle: *Calúto*, mattered.

INDICATIVE MOOD.

Present.	Future.
Cale, it matters.	*Carrà*, it will matter.
Imperfect.	**Conditional Present.**
Caléva or *caléa*, it mattered.	*Carrébbe*, it would matter.
Indeterminate Preterite.	
Calse, it mattered.	

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Cáglia, it may matter	*Calésse*, it might matter.

IV.

Dolére or *Dolérsi*, to grieve.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *dolérsi*, to grieve	Past: *E'sservi dolúto*, to have grieved
Present Gerund: *doléndosi*, grieving	Past Gerund: *Essèndosi dolúto*, having grieved
Past Participle: *dolútosi*, grieved	

INDICATIVE MOOD.

Present.	
Mi dólgo or *dóglio*, I grieve	*si dólse*, he grieved
ti duóli, thou grievest	*ci dolémmo*, we grieved
si duóle or *dóle*, he grieves	*vi doléste*, you grieved
ci dogliámo, we grieve	*si dólsero*, they grieved
vi doléte, you grieve	**Future.**
si dólgono or *dógliono*, they grieve	*Mi dorrò*, I shall or will grieve
Imperfect.	*ti dorrài*, thou wilt grieve
Mi doléva or *doléa*, I grieved	*si dorrà*, he will grieve
ti dolévi, thou grievedst	*ci dorrémo*, we will grieve
si doléva or *doléa*, he grieved	*vi dorréte*, you will grieve
ci dolevámo, we grieved	*si dorrànno*, they will grieve
vi dolevéte, you grieved	**Conditional Present.**
si dolévano, they grieved	*Mi dorréi* or *dorría*, I should or would grieve
Indeterminate Preterite.	*ti dorrésti*, thou wouldst grieve
Mi dólsi, I grieved	*si dorrébbe*, he would grieve
ti dolésti, thou grievedst	*ci dorrémmo*, we would grieve
	vi dorréste, you would grieve
	si dorrébbero, they would grieve

IMPERATIVE MOOD.

[No first Person.]	*dogliámoci*, let us grieve
Duóliti, grieve (thou)	*dolétevi*, grieve (ye or you)
si dólga, let him grieve	*si dólgano*, let them grieve

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che mi dólga or *dóglia*, that I may grieve	*Che mi doléssi*, that I might grieve
che ti dólga or *dóglia*, that thou mayst grieve	*che ti doléssi*, that thou mightst grieve
che si dólga or *dóglia*, that he may grieve	*che si dolésse*, that he might grieve
che ci dogliámo, that we may grieve	*che ci doléssimo*, that we might grieve
che vi dogliáte, that you may grieve	*che vi dolésse*, that you might grieve
che si dólgano or *dógliano*, that they may grieve	*che si doléssero*, that they might grieve

So conjugate—

Condolérsi to complain. | *Ridolére*, to lament again.

Observation.—*Dolére* signifies, also, to ache, and then it is used impersonally. Examples:—

Mi duóle la tésta, my head aches, or I have the headache.
Mi dólgono i dénti, my teeth ache, or I have the toothache.

V.

Dovére, to owe.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *dovére*, to owe	Past: *avére dovúto*, to have owed
Present Gerund: *dovéndo*, owing	Past Gerund: *avéndo dovúto*, having owed
Past Participle: *dovúto*, owed	

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INDICATIVE MOOD.

Present.

De'bbo, de'vo, de'ggio, I owe
de'bbi, de'vi, de'i, thou owest
de'bbe, de've, de'e, he owes
dobbiámo, deggiámo, debbidmo, we owe
dove'te, you owe
de'bbono, de'vono, de'nno, de'ggiono, de'ono, they owe

Imperfect.

dove'va or *dove'a*, I owed
dove'vi or *dove'i*, thou owedst
dove'va or *dove'a*, he owed
dovevámo, we owed
dovevate, you owed
dove'vano or *dove'ano*, they owed

Indeterminate Preterite.

dove'i or *dove'tti*, I owed
dove'sti, thou owedst
dovè or *dove'tte*, he owed
dove'mmo, we owed
dove'ste, you owed
dove'rono or *dove'ttero*, they owed

Future.

dovrò, doverò, devrò, I shall or will owe
dovrái, thou wilt owe
dovrà, he will owe
dovre'mo, we will owe
dovre'te, you will owe
dovránno, they will owe

Conditional Present.

Dovre'i, dovere'i, dovría, dovería, I should or would owe
dovre'sti or *dovere'sti*, thou wouldst owe
dovre'bbe, dovría, doverla, he would owe
dovre'mmo, we would owe
dovre'ste, you would owe
dovre'bbero, dovríano, doveríamo, they would owe

IMPERATIVE MOOD.

[No First Person.]
De'bbi or *de'vi*,* owe (thou)
de'bba, let him owe
dobbidmo, let us owe
dovéte, owe (ye or you)
de'bbano, let them owe

SUBJUNCTIVE MOOD.

Present.

Che de'bba or *de'ggia*, that I may owe
che de'bba or *de'ggia*, that thou mayst owe
che de'bba or *de'ggia*, that he may owe
che dobbidmo or *deggidmo*, that we may owe
che dobbiáte or *deggidte*, that you may owe
che de'bbano, de'vano, de'ggiano, that they may owe

Imperfect.

Che dove'ssi, that I might owe
che dove'ssi, that thou mightst owe
che dove'sse, that he might owe
che dove'ssimo, that we might owe
che dove'ste, that you might owe
che dove'ssero, that they might owe

VI.

Giacére, to lie down.

INFINITIVE MOOD.

Simple Tenses.

Present: *giace're*, to lie down
Present Gerund: *giace'ndo*, lying down
Past Participle: *giaciúto*, lain down

Compound Tenses.

Past: *ave're giaciúto*, to have lain down
Past Gerund: *ave'ndo giaciúto*, having lain down

INDICATIVE MOOD.

Present.

Giáccio or *giácio*, I lie down
giáci, thou liest down
giáce, he lies down
giacciámo or *giaciámo*, we lie down
giace'te, you lie down
giácciono or *giáciono*, they lie down

Imperfect.

Giace'va or *giace'a*, I was lying down
giace'vi, thou wast lying down
giace'va, he was lying down
giacevámo, we were lying down
giacevate, you were lying down
giace'vano, they were lying down

Indeterminate Preterite.

Giácqui, I lay down
giace'sti, thou layst down
giácque, he lay down
giace'mmo, we lay down
giace'ste, you lay down
giácquero, they lay down

Future.

Giacerò, I shall or will lie down
giacerái, thou wilt lie down
giacerà, he will lie down
giacere'mo, we will lie down
giacere'te, you will lie down
giacerámno, they will lie down

Conditional Present.

Giacere'i, I should or would lie down
giacere'sti, thou wouldst lie down
giacere'bbe, he would lie down
giacere'mmo, we would lie down
giacere'ste, you would lie down
giacere'bbero, they would lie down

IMPERATIVE MOOD.

[No First Person.]
Giácci, lie (thou) down
giácela or *giácia*, let him lie down
giacciámo or *giaciámo*, let us lie down
giace'te, lie (ye or you) down
giácciano or *giáciano*, let them lie down

SUBJUNCTIVE MOOD.

Present.

Che giáccia or *giácia*, that I may lie down
che giáccia, giácia, giácci, giáci, that thou mayst lie down
che giáccia or *giácia*, that he may lie down
che giacciámo or *giaciámo*, that we may lie down
che giacciáte or *giaciáte*, that you may lie down
che giácciano or *giáciano*, that they may lie down

Imperfect.

Che giace'ssi, that I might lie down
che giace'ssi, that thou mightst lie down
che giace'sse, that he might lie down
che giace'ssimo, that we might lie down
che giace'ste, that you might lie down
che giace'ssero, that they might lie down

VII.

Pare're, to seem.

INFINITIVE MOOD.

Simple Tenses.

Present: *pare're*, to seem
Present Gerund: *pare'ndo*, seeming
Past Participle: *párso* or *parúto*,† seemed

Compound Tenses.

Past: *e'ssere párso*, to have seemed
Past Gerund: *esse'ndo párso*, having seemed

INDICATIVE MOOD.

Present.

Pájo,‡ I seem
pári, thou seemest
páre or *pár*, he seems
pajámo, we seem
pare'te, you seem
pájono, they seem

Imperfect.

Pare'va or *pare'a*, I seemed
pare'vi or *pare'i*, thou seemedst
pare'va or *pare'a*, he seemed
parevámo, we seemed
parevate, you seemed
pare'vano or *pare'ano*, they seemed

Indeterminate Preterite.

Párvi or *párei*, I seemed
pare'sti, thou seemedst
párse or *párse*, he seemed
pare'mmmo, we seemed
pare'ste, you seemed
párvero or *pársero*, they seemed

Future.

Parrò, I shall or will seem
parrái, thou wilt seem
parrà, he will seem
parre'mo, we will seem
parre'te, you will seem
parránno, they will seem

Conditional Present.

Parre'i or *parría*, I should or would seem
parre'sti, thou wouldst seem
parre'bbe or *parría*, he would seem
parre'mmo, we would seem
parre'ste, you would seem
parre'bbero or *parríano*, they would seem

* Some Italians think that there is no imperative; but as excellent grammarians have given it, we prefer their opinion.

† *Parúto* is not so often used, and not so good as *párso*.

‡ Some Italians have used *páro, paridmo*, and *párono*, instead of *pájo, pajámo*, and *pájono*. The learner must take care not to imitate them, for the former come from *parére*, to adorn.

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IMPERATIVE MOOD.

[No First Person.]
pàri, seem (thou)
pèja, let him seem

pajàmo, let us seem
pare'te, seem (ye or you)
pèjano, let them seem

SUBJUNCTIVE MOOD.

Present.

Che pèja, that I may seem
che pèja, that thou mayst seem
che pèja, that he may seem
che pajàmo, that we may seem
che pajàte, that you may seem
che pèjano, that they may seem

che pare'ssi, that thou mightst seem
che pare'sse, that he might seem
che pare'ssimo, that we might seem
che pare'ste, that you might seem
che pare'ssero, that they might seem

Imperfect.

Che pare'ssi, that I might seem

VIII.

Persuade're, to persuade.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *persuade're*, to persuade	Past: *ave're persuàso*, to have persuaded
Present Gerund: *persuade'ndo*, persuading	Past Gerund: *ave'ndo persuàso*, having persuaded
Past Participle: *persuàso*, persuaded	

INDICATIVE MOOD.

Present.

Persuàdo, I persuade
persuàdi, thou persuadest
persuàde, he persuades
persuadiàmo, we persuade
persuade'te, you persuade
persuàdono, they persuade

Imperfect.

Persuade'va, I persuaded
persuade'vi, thou persuadest
persuade'va, he persuaded
persuadevàmo, we persuaded
persuadevàte, you persuaded
persuade'vano, they persuaded

Indeterminate Preterite.

Persuàsi, I persuaded
persuade'sti, thou persuadedst
persuàse, he persuaded
persuade'mmo, we persuaded
persuade'ste, you persuaded
persuàsero, they persuaded

Future.

Persuaderò, I shall or will persuade
persuaderài, thou wilt persuade
persuaderà, he will persuade
persuadera'mo, we will persuade
persuadere'te, you will persuade
persuaderànno, they will persuade

Conditional Present.

Persuadere'i, I should or would persuade
persuadere'sti, thou wouldst persuade
persuadere'bbe, he would persuade
persuadere'mmo, we would persuade
persuadere'ste, you would persuade
persuadere'bbero, they would persuade

IMPERATIVE MOOD.

[No First Person.]
persuàdi, persuade (thou)
persuàda, let him persuade
persuadiàmo, let us persuade

persuade'te, persuade (ye or you)
persuàdano, let them persuade

SUBJUNCTIVE MOOD.

Present.

Che persuàda, that I may persuade
che persuàda, that thou mayst persuade
che persuàda, that he may persuade
che persuadiàmo, that we may persuade
che persuadiàte, that you may persuade
che persuàdano, that they may persuade

Imperfect.

Che persuade'ssi, that I might persuade
che persuade'sse, that he might persuade
che persuade'ssimo, that we might persuade
che persuade'ste, that you might persuade
che persuade'ssero, that they might persuade

So conjugate—

Dissuade're, to dissuade.

LESSONS IN GREEK.—No. XLVII.

By JOHN R. BEARD, D.D.

FORMATION OF WORDS; VERBS, COMPOUNDS; RECAPITULATION.

VERBS are in various ways formed from nouns as stems. In the ensuing list the verbs are arranged according to their terminations, as they appear in the present tense:

Verbs in		Noun whence derived.
1. ο-ω	μισθο-ω, *I hire*	μισθο-ς, *wages, reward.*
	χρυσο-ω, *I gild*	χρυσο-ς, *gold.*
	ζημιο-ω, *I punish*	ζημι-α, *punishment.*
2. α-ω	τιμα-ω, *I honour*	τιμ-η, *honour.*
	αιτια-ομαι, *I accuse*	αιτι-α, *cause, blame.*
	γοα-ω, *I moan*	γοο-ς, *mooning.*
3. ε-ω	αριθμε-ω, *I number*	αριθμο-ς, *number.*
	ευτυχε-ω, *I am fortunate*	ευτυχης, *fortunate.*
	ιστορε-ω, *I investigate*	ιστωρ, *an investigator.*
4. ευ-ω	βασιλευ-ω, *I am a king.*	βασιλευ-ς, *a king.*
	βουλευ-ω, *I counsel*	βουλη, *counsel.*
5. ιζ-ω	ελπιζ-ω, *I hope*	ελπι-ς, *hope.*
	Ἑλληνιζ-ω, *I speak Greek*	Ἑλλην, *a Greek.*
	Φιλιππιζ-ω, *I favour Philip*	Φιλιππος, *Philip.*
6. αζ-ω	δικαζ-ω, *I judge*	δικη, *justice.*
	εργαζ-ομαι, *I labour*	εργον, *labour.*
	βιαζ-ομαι, *I use force*	βια, *force.*
7 αιν-ω	σημαιν-ω, *I signify*	σῆμα, *a sign.*
	λευκαιν-ω, *I whiten*	λευκος, *white.*
	χαλεπαιν-ω, *I am hard unwilling*	χαλεπο-ς, *hard.*
8. υν-ω	ἡδυν-ω, *I sweeten*	ἡδυ-ς, *sweet.*
	λαμπρυν-ω, *I adorn*	λαμπρο-ς, *brilliant.*

From the same noun as a stem may be derived several verbs, having different terminations and different meanings; thus, δουλο-, δουλο-ς, *a slave*; δουλο-ω, *I enslave*; δουλευ-ω, *I am a slave*; πολεμο-, πολεμο-ς, *war*; πολεμε-ω, and πολεμιζ-ω, *I carry on war*; πολεμο-ω, *to set in hostilities.*

Verbs may also be formed from verbs. There are three the idea conveyed by the primitive verb under certain modifications; these are called classes of verbs which set forth frequentative, inchoative, and desiderative. The frequentive are those verbs which denote a repetition of the act; the inchoative those which denote the incipiency or commencement of the act; and the desiderative are those which express a desire or inclination toward that which the primitive declares. These words are severally derived from *frequentatious*, a late Latin word, denoting repetition; *inchoo*, I begin; and *desidero*, I feel the want of, I wish for.

1. *Frequentatives.*

Frequentatives are formed partly from the unchanged stem by means of the terminations αζω, ιζω, υζω, partly by the conversion of the stem-vowel into ο with the termination ω, or by the lengthening of ο into ω, the termination αω being added; e. g.

στεν-αζω, *I groan frequently*	from	στενειν, *to groan.*
ῥιπτ-αζω, *I throw about*	,,	ῥιπτειν, *to throw.*
ωθ ιζω, *I push hither and thither*	,,	ωθεῖν, *to push.*
αιτ-ιζω, *I ask often, I beg*	,,	αιτεῖν, *to ask.*

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ἑρπ-υζω, I keep crawling	,,	*ἑρπειν, to creep.*
φορ-εω, I am wont to carry	,,	*φερειν, to bear.*
πορθ-εω, I wholly destroy	,,	*περθειν, to destroy.*
στρωφ-αω, I turn hither and thither	,,	*στρεφειν, to turn.*
νωμ-αω, I am used to manage	,,	*νεμειν, to pasture.*

Inchoatives.

Inchoatives are formed by the addition of the termination *σκω*, e. g.

μεθυ-σκω, I am addicted to drunkenness	from	*μεθυειν, to use strong [drink,*
ἡβα-σκω, I become an adult	,,	*ἡβᾶν, to be an adult.*

Desideratives.

Desideratives are generally formed from the first future of the primitive verb by the addition of the termination of *εω*; e. g.

γελασ-ε-ω, I desire to laugh	from	*γελᾶν, to laugh.*
πολεμησ-ε-ω, I wish to be in war	,,	*πολεμεῖν, to make war.*

Desideratives are formed also from verbal substantives by means of the terminations *ιαω*, and *αω*, e. g.

κλαυσ-ια-ω, I wish to weep	from	*κλαυσις, weeping.*
στρατηγ-ια-ω, I wish to be a general	,,	*στρατηγος, a general.*
θανατ-α-ω, I desire death	,,	*θανατος, death.*

COMBINATION.

Besides primitive and derivative words, the Greek language has compound words. Compound words are such as are made up of two words or more, and are designed to express complex ideas. To the multitude of compounds which the Greek possesses that language at once owes its richness and its exactitude, so that by means of a compound consisting of two or three components it expresses that for the full utterance of which several words would be required in English; e. g. *ὑποσφευγω* (*ὑπο, from, εκ, out of*, and *φευγω, I flee*) signifies *I flee home out of a place away from some one*; and *προκαταλαμβανω* (*προ, before, κατα, down*, and *λαμβανω, I take*) signifies *I take something before some one else.* The subject is very pregnant, and here can be only looked at superficially.

A noun which in combination takes the first place, appears in its stem-form, e. g.

ἀστυ-γειτων	*χορο διδασκαλο-ς*	*σακες-παλος*
city-neighbour	*choir-teacher*	*shield-shaker*
neighbouring city	*teacher of dancing*	*warrior.*

where *ἀστυ*, *χορο*, (*χορο-ς*) and *σακες* (*σακο-ς, a shield*) are in the stem-form.

Consonantal stems are in general united with the second compound by the connecting vowel *ο*, e. g.

ἀνδριαντ-ο-ποιος	*πατηρ-ο-κτονος*
image-maker	*father-slayer.*

This connecting *ο* is found also after short-vowels, as,

φυσι-ο-λογο-ς	*ἰχθυ-ο-φαγος*
nature-investigator	*fish-eater,*

and is the regular representative of an *α* in the stem, e. g.

ἡμερο-δρομο-ς	*χωρο-γραφο-ς*
day-runner	*place-describer.*

where the first components are *ἡμερα, a day*, and *χωρα, a place* or *country.*

The *ο* disappears before *ε* vowel, as,

χορ(ο)-ηγο-ς	*πατρ-αδελφος*
a choir-leader	*father's-brother.*

Yet, it remains in words which originally began with the aspirate which is called the digamma,* equivalent to our *v*, as *εαρ* (in Latin, *ver*), spring; also in *εικοσι* (Doric *Fικατι*, Latin *viginti*); thus,

δημιο-εργο-ς (Homeric)	*δημιουργος* (Attic)
hand-worker	*hand-worker.*

The termination of a word is often in combination somewhat changed, especially if the compound is an adjective; thus *τιμη* becomes *τιμο-ς*, and *πραγμα, πραγμων*, e. g.

φιλο-τιμο-ς	*πολυ-πραγμων*
honour-loving	*much-doing (a busy-body)*

The termination *ης* (masculine and feminine) and the termination *ες* (neuter) deserve attention; they are appended,

1. To many adjectives formed immediately from verbal stems, e. g.

α-βλαβ-ης	*αυτ-αρκ-ης*
un-injur-ed	*self-sufficient.*

2. To adjectives whose second component has arisen from a substantive in *ες* (nominative, *ος*), e. g.

δεκα-ετ-ης	*κακο-ηθ-ης*
ten-year-old	*bad-manner-ed.*

Let it be observed that I have kept the English as near in form as possible, in order to show at once the exact meaning of the Greek, and the possible analogy which the English might bear to it. Much is it to be regretted that our language has lost the greater portion of its combinative power; in its parent, the Anglo-Saxon, the facility of combination is very considerable.

Without changing its nature a verb cannot be combined with any word except a preposition. If another word is united with a verbal stem, the two combine to form a noun; thus, out of *λιθος, a stone*, and *βαλλω, I throw*, is formed *λιθο-βολο-ς, a stone-thrower.* Hence a verb may be formed as *λιθοβολε-ω, I throw stones*: so from *ναυς* and *μαχομαι* have we *ναυμαχος, a sea-fighter*, and thence *ναυμαχεω, I fight by sea*; also from *ευ* and *εργ* come *ευεργετης, a benefactor*, and *ευεργατεω, I act as a benefactor.*

A substantive with an abstract signification may unite with a preposition only by retaining its own termination; thus *βουλη, a determination*, becomes *προβουλη, a pre-ordination*; in every other combination an abstract noun must assume a derivation-ending; thus *λιθος* and *βολη* (*βαλλω*) give rise to *λιθοβολια, stone-throwing*; *ναυς* and *μαχη* give rise to *ναυμαχια a sea-fight*; and *ευ* and *πραξις* give rise to *ευπραξια, a good condition* (well-being, weal).

In regard to signification, compounds may be divided into three classes, determinatives, attributives, and objectives. The determinatives are those compounds in which the secondary component determines the exact meaning of the primary, and in these the second word is the primary or chief word; these compounds are the least numerous; as,

Determinative Compounds.

ὁμο-δουλο-ς	*ακρο-πολι-ς*
a fellow-slave	*the lofty-city* (acropolis).

* The Æolians, instead of the common *spiritus asper* or rough breathing, which we call "the aspirate," namely ['], had a less forcible aspirate, which was represented by the form F, and was called a digamma, or double Γ, because it is, in fact, two g's, the one being on the other. Thus, instead of

'Ελενη, the Æolians wrote Fελενα, in Latin *Helena*, found in our *Helen.*

'Εσπερα ,, Fεσπερα *Vesper* ,, *Vespers.*

This F was also put before words which in other dialects had not the aspirate, e. g.

οἰνος, Æolic Fοῖνος, Latin *vinum*, English *wine*, French *vin.*

The digamma was also inserted in the middle of some words:

ναῦς, gen. νεος, Æolic ναFος, Latin *navis*, English *naval.*

αἰων ,, αFιων ,, *aevum* ,, *coeval.*

ὀϊς ,, οFις ,, *ovis* ,, a sheep

Attributive Compounds.

The attributives are those in which also the second word is determined by the first, but the idea formed by the two is *attributed* as a quality to another word, thus ὁμο-τροπο-ς signifies not *the same kind*, (τροπος), but *being of the same kind, having the same disposition*; and μακροχειρ is not *a long hand*, but *having a long hand*, or *being long-handed*. So αργυροτοξος is not *a silver bow*, but *provided with a silver bow, a bearer of a silver bow*; and ενθεος denotes one who has a divinity within him, *divinely inspired*.

Objective Compounds.

The objectives are those in which one element is governed by the other, the latter being *the object* to the former; thus δεισι-δαιμων *superstitious, god fearing*, where, as in *god-fearing*, δαιμων is governed by δεισι, and the word is equivalent to τους δαιμονας δεδως, *fearing the divinities*. So ηνι-οχος, *rein-holding* is the same as τα ηνια εχων. In the same manner consider λογογραφος, *speech-writer* (historian or *fabulist*); αξιο-λογος, *worthy of record*, and χειροποιητος, *hand-made*, that is, *made by the hand*, χερσι ποιητος. Sometimes the first component is the object, sometimes the second. Especially common are compounds with the prefix αν (ανιν, Latin *sine*, without), which before consonants becomes α, and which, on account of its negative or privative force, is termed *alpha privative*; e. g.

α-γραφο-ς	α-μητωρ
un-written	*mother-less*, or in form more exactly *un-motherly*.
ατεκνος	αναιδης
child-less	*shame-less* (*un*-child-like, *un*-ashamed).

The prefix ευ, *well*, and the prefix δυς, *hardly*, with difficulty, form many compounds; e. g.

ευτοκος	ευτειχης	δυςαριστος	δυςθυμια
easily-bearing	*well-walled*	*dis-pleased*	*dis-satisfaction*.

Verbal Adjectives.

Verbal adjectives have two endings, one in τος, the other in τεος. Those in τος resemble in signification the Latin participle in *-tus*, as ποιητος, *factus*, that is, made; so γραπτος, *scriptus*, written. Many, and perhaps the greater number of them, more nearly approach the Latin adjectives in *-bilis*, as θαυμαστος, *mirabilis*, admirable; or they express a simple possibility, as ορατος, visible, an object that may be seen; ακουστος, audible.

Verbal adjectives in τεος have the same force as the Latin participle in *-dus*, and denote duty or necessity, as δοτεος, *dandus*, must be given. The adjectives in τεος, like the participle in *-dus*, has three genders, so as to agree with any noun that may be joined with it; they may also be used in the neuter in a general way, as signifying necessity; thus:

Greek.	*Latin.*	*English.*
ανηρ λυτεος εστιν	*vir solvendus est*	the man must be set free.
τιμητια εστιν ἡ αρετη	*virtus honoranda est*	virtue must be honoured.
γραπτεον εστιν	*scribendum est*	it is necessary to write.

Both these adjectives are formed from the verbal stem. An easy practical way to form them is to change the termination of the first aoriet passive, θεις, into τος or τεος, e.g.

λυω	λυ-θεις	λυ-τος	λυ-τεος
τιμαω	τιμη-θεις	τιμη-τος	τιμη-τεος
ακουω	ακουσ-θεις	ακουσ-τος	ακουσ-τεος
πανω	παυ(σ)-θεις	πανσ-τος	πανσ-τεος
τιμαω	τιμη-θεις	τιμη-τος	τιμη-τεος
στελλω	σταλ-θεις	σταλ-τος	σταλ-τεος
διδωμι	δο-θεις	δο-τος	δο-τεος

If a φ or χ (aspirate) occur in the aorist participle, they are changed into the corresponding *lenes* on account of the τ in τος and τεος; thus φ returns to π and χ to κ; e. g.

τυπτω	τυφ-θεις	τυπ-τος	τυπ-τεος
γραφω	γραφ-θεις	γραπ-τος	γραπ-τεος
λεγω	λεχ-θεις	λεκ-τος	λεκ-τεος

Before you proceed any further, make a list arranged alphabetically of all the Greek words you have had in the preceding instructions and exercises. Commit that list carefully to memory; look over it from time to time so as to refresh your memory, and fix each word firmly in your mind. Then arrange the words etymologically, that is, according to their derivations and under their several roots. By this means you will obtain a great command of the Greek vocabulary, and find translation easy. In going forward you will then find the truth of these words, which every student should take as his motto:

Παντ' εστιν εξευρειν, εαν μη τον πονον φευγῃ τις.

Review.

I have thus conducted you through the inflected words, entering into such details as the occasion permitted and necessity seemed to require. If now you have studiously gone through the foregoing lessons, you are familiar with the derivation and formation of the nouns, adjectives, and verbs of the Greek language. There are some indeclinable words in which some instruction is desirable. That given, Syntax will demand attention. But before we pass on to these two subjects, I will give you some exercises which will lead you to review the ground over which you have gone as well as enable you to ascertain your progress. I recommend you to study these exercises first without any aid from the grammar or the vocabulary. You ought to be able to construe them independently of those aids. If, however, after considerable effort, you fail to make out any sentence, then seek the usual assistance. Bear in mind that if ever you are to run alone you must learn to walk alone, and you are not to expect to be able to construe a Greek author if you cannot discover the sense of an easy sentence.

RECAPITULATORY EXERCISES.

Η σιληνη τα μιρη του μηνος φανερα ποιει. Τῳ των Περσων βασιλει πολλα εθνη πειθομενα ην. Ὁ βους κερατι καιει, ὁ ἱππος ὁπλῃ, ὁ κυων στοματι, ὁ καπρος οδουτι. Ῥητορος αρετη εστι ταληθῃ λεγειν. Κερδη πονηρα ζημιαν αει φερει. Δουλευειν παθεσι χαλεπωτερον η τυραννοις. Περικλεα μαλιστα εφοβειτο ὁ των Αθηναιων δῆμος. Οι κυνες τους λυκους απο των προβατων απερυκουσιν. Εν νῳ εχω τοῖν ανδροῖν παραδουναι εμαυτον. Ὁ αγων περι γυναικων και περι τεκνων και περι παντων εστιν. Οι Αθηναῖοι νανσι τριακοντα εβοηθουν. Οι Λυκιοι τας γυναῖκας πλειον ετιμων η τους ανδρας. Αχαριστοι η αμελεις η πλειονεκται η απιστοι η ακρατεις ανθρωποι ου δυνανται φιλοι γενεσθαι. Ἡ των Αθηναιων πολις αρχαιοτατη ην και μεγιστη και ονομαστοτατη. Χαλεπον μεν εστιν εκφυγειν θανατον, πολυ δε χαλεπωτερον πονηριαν. Διδασκαλῳ μελει βελτιους ποιειν τους νεωτερους. Ἡ θηρα τοις Περσαις δοκει ειναι αληθεστατη μελετη προς τον πολεμον. Παιδευομεν τους παῖδας τους γεραιτερους προτιμᾶν. Ανθρωπῳ παντων των αλλων ζωων ῥᾳον εστιν η ανθρωπων αρχειν. Ταχιστον εντι νοῦς, δια παντος γαρ τρεχει. Ἡ φιλοτιμια μαλιστα παροξυνει προς τα αγαθα και εντιμα. Ἡ ψυχη βασιλευει εν ἡμιν. Ει παρα σοι καλῶς εχει, θαῤῥει. Ῥᾳστον ἁπαντων εστιν αὐτον εξαπατᾶν. Ὡ αγαθε, μη αγνοει σεαυτον. Ὁ αγων ὑπερ ψυχῶν των ἡμετερων εστιν. Ὡ παιδες, τιμᾶτε αλληλους. Ὁστις διαβολαις ταχυ πειθεται, πονηρος αυτος εστι τους τροπους. Λεγε το ψηφισμα. Ανδρος αγαθοῦ εργα πρασσε. Οι παλαιοι ἡλιον τε και σεληνην ενομιζον θεους ειναι. Ὁ ταληθῃ λεγων σπειθανεται πολλοῖς. Μιλτιαδης ωνομαζετο σωτηρ τῆς Ἑλλαδος.

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Δικαια λεγοντες πολλοι αδικα ποιουσιν. Ουδεις μισει τους επαινουντας. Θαρρων πειρω αγαθος γιγνεσθαι. Διδασκειτε τους παιδας αληθειαν και μη εξαπαταν. Σωκρατης ελεγε τους μεν αλλους ανθρωπους ζην ινα εσθιωσιν, αυτον δε εσθιειν ινα ζωη. Οι Ελληνες το παλαι προς λυπτειαν ετραποντο. Μετα την εν Κορωνειᾳ μαχην οι Αθηναιοι εξελιπον την βοωτιαν πασαν. Ἡ γλωσσα πολλους εις ολεθρον ηγαγεν. Θησευς καταλιπων την Αριαδνην εν Ναξῳ απεπλευσεν. Οι Λακεδαιμονιοι εκεβαλον εις την Αττικην, των Αθηναιων τους αγρους καταλιποντων. Πεισομαι μαλλον Θεῳ η ανθρωποις. Τους φιλους πλουτιζων σαυτον πλουτιεις. Ὁ Ξερξης ηλπιζεν ει τας Αθηνας καταστρεψαιτο, ραδιως των αλλων Ἑλληνων αρξειν. Ὁ Σωκρατης ουκ επετρεψε τῳ δημῳ παρα τους νομους ψηφισασθαι. Οιους φοβουμενοι μη ποτ' ασεβις μηδεν, μηδε ανοσιον μητε ποιησητε μητε βουλευσητε. Μονος ὁ ανθρωπος γυμνος και ανοπλος ὑπο της φυσεως απολελειπται. Ὁ Αισχινης παις ων μετα πολλης ενδειας ετραφη. Ουτοι εγωγε τουτο πωποτε επεισθην, ὡς ἡ ψυχη, εως μεν αν εν θνητῳ σωματι ᾖ, ζῃ, οταν δε τουτου απαλλαγη, τεθνηκεν. Αρχιμηδης ειπε· δος ποῦ στῶ και την γην κινησω. Οταν νομευς αγαθον κυνα εχῃ, και οι αλλοι νομεις βουλονται πλησιον αυτου τας αγελας ἱσταναι, ινα του κυνος απολαυωσιν. Αληθεια παριστω σοι και εμοι, παντων χρημα δικαιοτατον. Ει ἡττηθησεσθε, εν ἱστε ὁτι παραδωσειτε παντα τοις πολεμιοις. Οι Πιρσαι ὁν αν γνωσι δυναμενον μεν χαριν αποδιδοναι, μη αποδιδοντα δε, κολαζουσι τοῦτον ισχυρως. Δος τι και λαβε τι. Τας μαθησις ουκ επι τεχνῃ εμαθες, ὡς δημιουργος εσομενος, αλλ' επι παιδιᾳ. Οι πολιμιοι φοβουμενοι ἡμας αποδιδρακασιν, πολλα γαρ ηδη κακα ὑφ' ἡμων πεπονθασιν. Ὁτι δει βοηθειν παντες εγνωκαμεν. Οι Αθηναιοι οξυτατοι ἡσαν γνωναι τα ῥηθεντα. Ἡδυ μεν αρτος πεινωντι φαγειν, ὑδωρ δε διψωντι πιειν. Πολλοι δια την δοξαν και πολιτικην δυναμιν μεγαλα κακα πεπονθασιν. Ταληθῆ μετα παῤῥησιας ερῶ προς ὑμας και ουκ αποκρυψομαι. Ὁ Ἑλλησποντος εκληθη απο της Ἑλλης εν αυτῳ θανουσης.

CHRONOLOGY.—No. II.

B.C.
992—Beleazar ascends the throne of Tyre.
975—Revolt of the Ten Tribes, and separation of the kingdoms of Judah and Israel.
970—Shishak, king of Egypt, captures and sacks Jerusalem.
958—Abijah king of Judah.
955—Asa succeeds Abijah.
953—Lycurgus flourished about this date.
952—Baasha possesses himself of the throne of Israel.
943—Raid of the Ethiopians on Egypt.
924—Zimri murders Elah, and is in his turn murdered by Omri.
917—Ahab king of Israel.
905—Elijah predicts the famine of three years and a half.
904—Homer, the Greek poet, flourished.
900—Promulgation of the Menu code of laws, and division of the Hindoos into castes or classes.
897—Death of Ahab.
896—Accession of Sardanapalus
892—Elisha, the prophet, restores the son of the Shunammite to life.
891—Jehoshaphat conquers the Philistines and Ammonites.
886—Carthage founded by Dido.
884—Accession of Athaliah, queen of Judah, and of Jehu, tenth king of Israel.
884—Olympic games established at Elis.
876—End of the Assyrian Empire, with the death of Sardanapalus.
867—Accession of Aristodemus, eighth king of Corinth.
856—Jehoahaz king of Israel.
814—Foundation of the kingdom of Macedon.
809—Uzziah king of Judah.
779—The monarchy of Corinth exchanged for an annual magistracy.
771—Fall of Nineveh.
753—Rome founded by Romulus.
741—Accession of Ahaz, king of Judah.
738—Hoshea, last king of Israel, ascends the throne.
732—Death of Pul, king of Assyria.
B.C.
720—Samaria taken after three years' siege, and the kingdom of Israel punished by Shalmaneser, who carries the ten tribes into captivity.
710—The Medes throw off the Assyrian yoke.
669—Battle of the Horatii and Curatii.
670—The Messenians founded Messina, Sicily.
667—Death of Esarhaddon, king of Assyria.
658—Sappho, the Greek lyric poetess, flourished.
629—Sinope founded.
627—Draco legislates for the Athenians.
607—Capture of Nineveh.
605—Death of Pharaoh-Necho.
600—Byzantium (now Constantinople) built by a colony of Athenians.
587—Jerusalem taken after a siege of eighteen months.
576—Buddhism introduced into India.
560—Pisistratus seizes on the government of Athens.
559—Cyrus king of Persia.
558—Solon, the Athenian lawgiver, flourished.
557—Birth of Simonides, the poet.
556—Æsop, the Greek fabulist, flourished.
550—Doric and Ionic architecture brought to great perfection about this time.
548—Thales, the first Greek astronomer and geographer, flourished.
546—Capture of Sardis.
540—Birth of Æschylus, the dramatic poet.
538—Kingdom of Babylon ended.
537—Cyrus issues an edict permitting the Jews to return to their own land.
533—Expulsion of King Tarquin from Rome; Rome afterwards governed by consuls till the battle of Pharsalia, being a period of 461 years.
531—Pythagoras, the Greek philosopher, flourished.
504—Sardis taken and burnt by the Athenians.
498—Battle of Lake Regillus, and victory of the Romans over the Latins.
490—Battle of Marathon.
483—Revolt of the Volscians from Rome.

ANSWERS TO CORRESPONDENTS.

X. N. B.—The difference between sulphuric and sulphurous acid is this: sulphuric aid is found to consist of three atoms of oxygen united to one of sulphur, or 24 to 16; sulphurous acid is found to consist of one atom, or equivalent of sulphur, united to two of oxygen.

A Young Student.—The examination for the degree of doctor of medicine takes place at the University of London every year, commencing on the first Monday in November.

No candidate is admitted to this examination unless he produce certificates to the following effect:—

1. Of having taken the degree of bachelor of medicine in this university.

2. Of having attended, subsequently to having taken the degree of bachelor of medicine in this university,

To clinical or practical medicine during two years in a hospital or medical institution recognised by this university.

Or, to clinical or practical medicine during one year in a hospital or medical institution recognised by this university, and of having been engaged during three years in the practice of his profession.

Or of having been engaged during five years in the practice of his profession, either before or after taking the degree of bachelor of medicine in this university.

One year of attendance on clinical or practical medicine, or two years of practice, will be dispensed with in the case of those candidates who at the second examination have been placed in the first division.

3. Of moral character, signed by two persons of respectability.

These certificates must be transmitted to the registrar at least fourteen days before the examination begins.

The fee for the degree of doctor of medicine is £5, or £10 to those who have not paid fees for preliminary examination. No candidate will be admitted to the examination unless he has previously paid this fee to the registrar. If a candidate fail to pass the examination, the fee will not be returned to him; but he will be admissible to any subsequent examination for the same degree without the payment of any additional fee, provided that he gives notice to the registrar at least fourteen days before the commencement of the examination.

The examination is conducted by means of printed papers and *viva voce* interrogation.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LIV.

(*Continued from page* 4.)

THE EYE CONSIDERED AS AN OPTICAL INSTRUMENT.

Polariscopes or Analysers.—These names are given to small instruments which serve to show when light is polarised and to determine its plane of polarisation. The analysers in most frequent use are a plate of black glass, a thin plate of turmalin, the double refracting prism, Nichol's prism, and the piles of glasses which we have mentioned before.

1. *Black Glass.*—It will be seen by the figure which we give below (fig. 349) that in the apparatus there represented a black glass, *m*, shows whether the light is polarised by not reflecting it at the angle of polarisation when the plane of incidence upon this glass is perpendicular to the plane of polarisation; consequently the glass, *m*, is a polariser.

2. *Turmalin.*—The most simple analyser is a plate of brown turmalin cut parallel to the axis of crystallisation. This mineral, which is double refracting, has the property of not allowing any but natural light, and light polarised in a place perpendicular to its axis, to pass through it; but it acts as an opaque body with regard to polarised light whose plane of polarisation is parallel to the axis. To make use of this analyser, we interpose it between the eye and the luminous pencil which we wish to observe. We then turn the turmalin slowly in its own plane, and if the pencil always exhibits the same intensity, it does not contain polarised light; but if the brightness successively decreases and increases, the pencil contains so much more polarised light as the variations of brightness are more considerable. At the moment when it is least, the plane of polarisation is determined by the axis of the turmalin and by the visual ray. It is the extraordinary ray which goes through turmalin cut parallel to the axis; the ordinary ray is completely absorbed, at least if the turmalin is sufficiently coloured.

3. *Double Refracting Prism.*—Double refracting prisms are made of Iceland spar, and employed as analysers in many optical instruments, particularly in Biot's apparatus for studying circular polarisation (fig. 351). It is necessary for these prisms to be achromatic, for when the light which passes through them is not simple, it is decomposed by refraction. For this purpose we attach to the prism of Iceland spar a second prism of glass placed at such an angle that, by refracting the light in an opposite direction, it almost completely destroys the effect of dispersion.

The double refracting prism being fixed at the extremity of a copper tube (fig. 346), we know that a luminous pencil

Fig. 346.



which is made to pass through this tube is completely polarised, when on turning the tube about itself, we find four rectangular positions in the course of one revolution in which we perceive only one image. It is the ordinary image which disappears when the plane of the principal section is perpendicular to the plane of polarisation, and it is the extraordinary image which disappears whenever the plane of polarisation coincides with the principal section. In all other positions which the double refracting prism assumes, the relative intensity of the images varies. We see, at the same time, that the double refracting prism may serve to determine the direction of the plane of polarisation, since it is sufficient to seek for that position of the principal section of the prism in which, the incident pencil being perpendicular, the extraordinary image disappears.

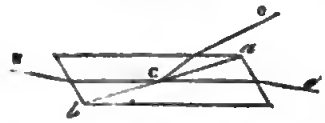
Nichol's Prism.—This is the most valuable analyser, because it is altogether colourless, completely polarises the light, and transmits only a single polarised ray in the direction of its axis. To form it, take a parallelopiped of Iceland spar about an inch and a half to two inches and a half high, and about a third of an inch broad. Cut it in two, in a plane perpendicular to the plane of the large diagonals of the bases, and passing through the obtuse vertices which are nearest each other. Then join the two halves in the same order as balsam of Canada. The parallelopiped thus constructed constitutes Nichol's prism (fig. 347). The index of refraction for balsam of

Fig. 347.



Canada being less than the ordinary index of Iceland spar, but greater than its extraordinary image, the consequence is that when a luminous ray s c (fig. 348), penetrates the prism,

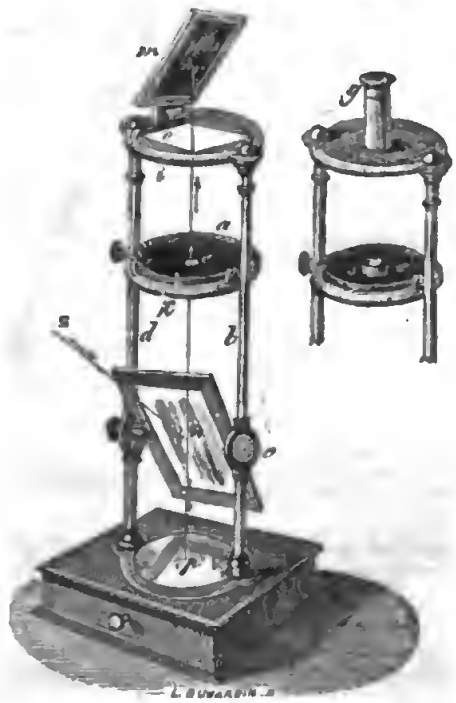
Fig. 348.



the ordinary ray undergoes a total reflection on the surface, *a b*, and takes the direction c o, while the extraordinary ray c e alone passes through; that is to say, Nichol's prism, like turmalin, only allows the extraordinary ray to pass through it, and may therefore be used as an analyser. It is also employed to obtain a pencil of white polarised light. The double refracting prism is also employed for the same purpose.

Noremberg's Apparatus.—Noremberg has invented an apparatus, by means of which, at no great expense, most of the experiments relating to polarised light may be performed. This apparatus is composed of two upright supports, *b* and *d*, fig. 349, made of copper, which sustain a glass *n*, not plated, and

Fig. 349. Fig. 350.



moveable about a horizontal axis. A small circle *c*, at the side of it, which is graduated, shows the angle made by the glass with the vertical line. Between the feet of the two supports is a plated glass *p*, which is fixed and horizontal. At the top of the supports is a graduated rim *i*, in which a circular disc *o*, can turn round. This last, in the centre of which is a square opening, contains a black glass *m*, making, with the vertical, an angle equal to that of polarisation. Lastly, an annular disc *k*, is capable of being fixed at any height by means of a thumb-screw. A second circle *d*, supported by the other *k*, is capable of being inclined at various angles, and has a screen *e*, with a circular opening at its centre.

Supposing the glass *n*, to make with the vertical an angle of 35° 25', that is to say, an angle equal to the angle of polarisation for glass, the luminous rays *s n*, which meet this glass at that angle, are polarised on reflection in the direction *n p* towards the glass *p*, which sends them back in the direction *p n r*. After having gone through the glass *n*, the polarised pencil falls on the black glass *m*, at an angle of 35° 25', since this glass makes precisely the same angle with the vertical. Now, if we move the disc *o*, to which the glass *m* is fixed, horizontally, the glass will also move, but without altering its inclination, and two positions will be observed in which it does not reflect the incident peneil *n r*, that is, when the plane of incidence upon this glass is perpendicular to the plane of incidence *c n p* on the glass *n*. Such is the position represented in the accompanying figure. In every other position the polarised pencil is reflected by the glass *m*, in various degrees, and the maximum of light is reflected when the planes of incidence on the glasses *m* and *n* are parallel. If the glass *m*, makes with the vertical an angle greater or less than 35° 25', the polarised pencil is always reflected in all positions of the plane of incidence.

When, instead of receiving the polarised light on the black glass *m*, it is received by a double refracting prism placed in a tube *g*, fig. 350, we obtain only one image whenever the plane of the principal section of the prism coincides with the plane of polarisation on the glass *n*, and then it is the ordinary ray which is transmitted. Only one image also is seen when the plane of the principal section is perpendicular to the plane of polarisation, and it is the extraordinary image which then passes. In every other position of the double refracting prism, two images are seen, the brightness of which varies with the position of the principal section.

Lastly, if turmalin be substituted for the double refracting prism, and turned about itself, the polarised pencil completely disappears when the axis of the turmalin is parallel to the plane of incidence *s n p*.

Thus the different properties of polarised light may be demonstrated. Noremberg's apparatus may also be employed in the observation of the colours of polarised light, and the study of circular polarisation in quartz.

CIRCULAR POLARISATION.

Rotation of the Plane of Polarisation.—When a polarised ray passes through a plate of quartz cut perpendicularly to the axis of crystallisation, this ray is again polarised on emerging, but no longer in the same plane of polarisation as before its entrance. With some specimens, the new plane is turned to the right of the old one, with others to the left. To this phenomenon is given the name of circular polarisation. It was first observed by Seebeck and Arago, but was particularly studied by Biot, who established the following laws.

1. The rotation of the plane of polarisation is not the same for the different simple colours, and is greater in proportion as the colours are more refrangible.

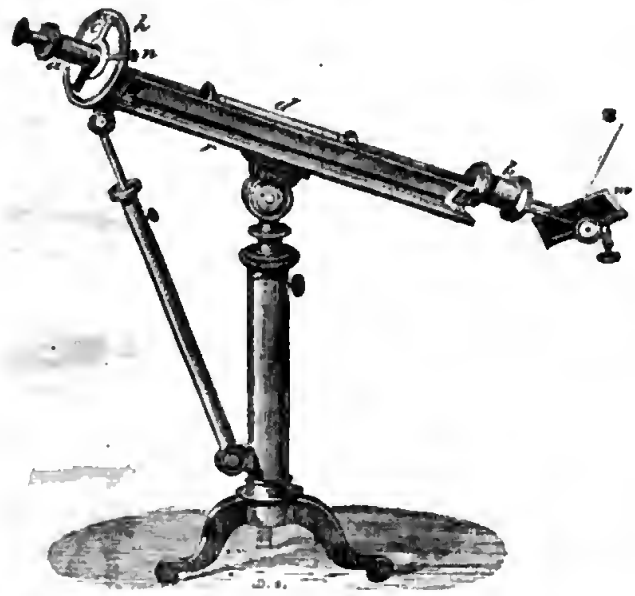
2. For the same simple colour, and plates of the same crystal, the rotation is proportional to the thickness.

3. In the rotation from right to left, or from left to right, the same thickness gives apparently the same rotation.

Substances which turn the plane of polarisation to the right, are called *dextrogyral* (that is, turning to the right). To this class belong sugar dissolved in water, essence of lemon, alcoholic solution of camphor, dextrine and tartaric acid. Substances which turn the plane of polarisation to the left, are called *lævogyral* (that is, turning to the left). Essence of turpentine, essence of laurel, and gum Arabic, come under this head.

Coloration produced by Circular Polarisation.—On looking with a double refracting prism at a thin plate of quartz cut perpendicularly to the axis and traversed by a pencil of polarised light, we observe two images brightly coloured, whose colours are complementary. On then turning the prism to the right or left, the two images change colours, and successively assume all the colours of the rainbow, still continuing to be complementary to each other. This phenomenon is a consequence of the first law of circular polarisation. It may be very well observed by means of Noremberg's apparatus, fig. 849. For this purpose, place upon a screen *e*, fig. 850, a plate of quartz

Fig. 851.



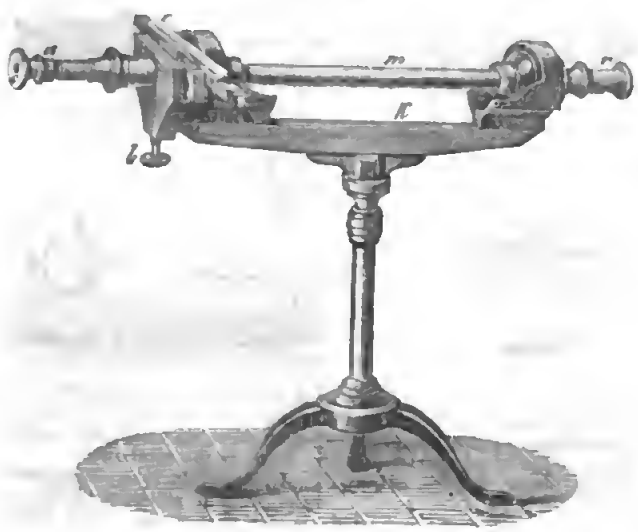
e, cot perpendicularly to the axis and fixed in a cork. Then the glass *n*, fig. 349, being inclined in such a manner as to transmit a polarised pencil to the quartz, look through a double refracting prism *g*, fig. 350, at the same time turning the tube in which this prism is, and you will observe the complementary images produced by the passage of the polarised light through the quartz.

Rotatory Power of Liquids.—Quartz is the only solid in which circular polarisation has been observed, but Biot found the same property in many liquids and solutions. The same philosopher observed that the displacement of the plane of polarisation may exhibit differences in the composition of bodies, which could not be detected by any chemical analysis. For example, sugar obtained from the grape turns the plane of polarisation to the left, while sugar from the cane turns it to the right, though the chemical composition of the two substances is the same. Biot found that the rotatory power of liquids is much less than that of quartz. For instance, in concentrated syrup of sugar from the cane, which is one of the liquids possessing the rotatory power in the highest degree, this power is thirty-six times less than in quartz, in consequence of which it is necessary to experiment upon liquid columns of considerable length, that is to say, about eight inches.

Fig. 351 represents the apparatus employed by Biot to measure the rotatory power of liquids. In a copper channel *g*, fastened to a support *r*, is a tube about eight inches long, containing the liquid on which we wish to experiment. This tube is plated internally and terminated at the ends by two parallel glasses, fastened by two collars with screws. At *m* is a black glass, making with the axis of the tubes *b*, *d*, and *a*, which is the same for all three, an angle equal to the angle of polarisation, the consequence of which is, that the light reflected by the glass *m* in the direction *b d a*, is polarised. In the centre of the divided circle *h*, in the tube *a*, and perpendicular to the axis *b d a*, is a double refracting achromatic prism, which can be turned at will round the axis of the apparatus by means of a button *u*, fastened to a dial plate with a vernier, which indicates the number of degrees through which the prism is turned. Lastly, the plane of polarisation *e a d*, of the reflected pencil is vertical, and the zero of the graduation on the circle *h*, is in this plane. Before the tube *d*, is placed in the channel *g*, the extraordinary image given by the double refracting prism vanishes, as often as the disc *e*, corresponds to the zero of the graduation, because then the double refracting prism is turned in such a manner, that its principal section coincides with the plane of polarisation. It is the same when the tube *d* is full of water or any other inactive liquid, like alcohol or ether, which shows that the plane of polarisation has not turned. But if we fill the tube with a solution of cane sugar, or any other active liquid, the extraordinary image reappears, and to destroy it we must turn the disc a certain number of degrees to the right or left of zero, according as the liquid is dextrogyral or lævogyral, which proves that the plane of polarisation has turned through the same number of degrees. With solution of cane sugar, the rotation takes place to the right, and if with the same solution we take tubes of greater length, we find the rotation is increased in proportion to the length, according to Biot's second law. Lastly, if with a tube of constant length we take solutions containing more and more sugar, we find the rotation increase in proportion to the increase of sugar, whence we see that from the angle of deviation we may deduce the quantitative analysis of the solution.

Soleil's Saccharimeter.—Soleil availed himself of the rotatory property of liquids, which was discovered by Biot, to construct an apparatus for analysing saccharíferous (or sugar-bearing) substances, to which is given the name of *saccharimeter*. Fig. 352 represents the saccharimeter placed horizontally, and fig. 353 represents a longitudinal section, with all the recent modifications introduced by Duboscq, Soleil's son-in-law and successor. This instrument, which is apparently simple, is very complicated in a theoretical point of view, for it presupposes a knowledge of the principal phenomena of double refraction and polarisation. The principle of this apparatus is not the amount of the rotation of the plane of polarisation,

Fig. 352.



like that of Biot, above described, but *compensation*, that is to say, the employment of a second active substance, acting in a direction opposite to that in which we wish to analyse, and the thickness of which may be varied until the contrary actions of the two substances destroy each other; so that, instead of measuring the deviation of the plane of polarisation, we measure the thickness to be given to the compensating substance (which is a plate of quartz), to obtain a complete compensation. There are three principal parts in the apparatus; a tube containing the liquid to be analysed, a polariser, and an analyser. The tube *m*, which contains the liquid, is of copper, plated inside, and terminated at its two extremities by two glasses parallel to each other. It rests upon a support *k*, which has at its ends two tubes, *a* and *r*, in which are the crystals that serve as polarisers and analysers, and are represented in fig. 353.

Before the orifice *e* (fig. 353) is placed a moderator lamp, the light proceeding from which, in the direction of the axis of the instrument, meets a double refracting prism *r*, which acts as a polariser. Only the ordinary image reaches the eye,

the extraordinary image being thrown back beyond the field of vision, in consequence of the magnitude of the angle between the ordinary and extraordinary images. Lastly, the double refracting prism is in such a position that the plane of polarisation is vertical, and passes through the axis of the apparatus.

On leaving the double refracting prism, the polarised pencil meets a plate of quartz *q*, which has a double rotation, that is to say, it turns the plane of polarisation both to the right and the left at the same time. For this purpose it is formed of two plates of quartz, with contrary rotation, placed side by side, as shown in fig. 356, in such a manner that the line of separation is vertical, and in the same plane as the axis of the apparatus.

After having passed through the quartz *q*, the polarised pencil passes into the liquid contained in the tube *m*, and there meets with a fresh plate of quartz *i*, which is simple and of arbitrary thickness.

At *n* is the compensator intended to destroy the rotation of the liquid column *m*. It is formed of two plates of quartz, having the same rotation, whether to the right or left, but contrary to that of the plate *i*. These two plates of quartz, sections of which are represented in fig. 360, are made by obliquely cutting a piece of quartz with parallel faces, in such a manner as to form two prisms with the same angle *n* and *n'*. Then by placing the two prisms side by side, as represented in the figure, we get a single plate with parallel faces, which possesses the advantage of being capable of varying in thickness. For this purpose both prisms are fixed in a groove in such a manner as to be capable of sliding in one direction or the other, still preserving their parallelism to the homologous faces. This motion is produced by means of a double-toothed wheel and a pinion turned by the button *b* (figs. 352 and 353).

When the plates are displaced in the directions indicated by the arrows in fig. 354, it is evident that their combined thickness increases, and when they are moved in the opposite directions it is diminished. A scale *e*, and a vernier *v* (fig. 352) follow the plates in their motions and serve to measure the variations of thickness in the compensator. This scale, which, with its vernier, is represented in fig. 355, has two sets of divisions with the same zero for both, the one from left to right for dextrogyral liquids, and the other from right to left for lævogyral liquids. When the vernier is at zero, the combined thickness of the two plates *n* and *n'* is precisely equal to that of the plate *i*, and as the rotation of this latter is contrary to that of the compensator, the effect is nothing. But if we move the plates of the compensator in either direction, this or the quartz *i* overbalances the other, and there is rotation to the right or left. Next to the compensator, there is a double refracting prism *a*, which serves as an analyser for the observation of the polarised pencil which has passed through the liquid and the various plates of quartz.

Diffraction is a modification to which light is subject when it grazes the outline of a body or passes through a very small opening, a modification in consequence of which the luminous rays appear to bend and penetrate into the shade. To observe the phenomenon of diffraction, let a pencil of light pass through a very small aperture in the window-shutter of a dark room, and let it fall upon a convergent lens *L*, with short focal distance (fig. 357). Place a red glass at the aperture so as to

Fig. 357.



allow none but red light to pass. An opaque screen *e*, with a thin edge, placed behind the lens and beyond its focus, intercepts half of the luminous cone, while the other half is projected upon a screen *b*, the front view of which is at *a*. We then observe, within the geometrical shadow bounded by the straight line *a b*, a reddish and rather bright light, which decreases in brightness in proportion as the points of the screen are more distant from the boundary line of the shadow, and on the part of the screen which ought to be uniformly lighted are seen fringes alternately bright and dark, which grow gradually feebler till they completely disappear.

All the various colours of the spectrum give rise to the same phenomenon, but with this distinction, that the fringes are narrower, and consequently less dilated, in proportion as the light is less refrangible. The result of this last property

Fig. 353.

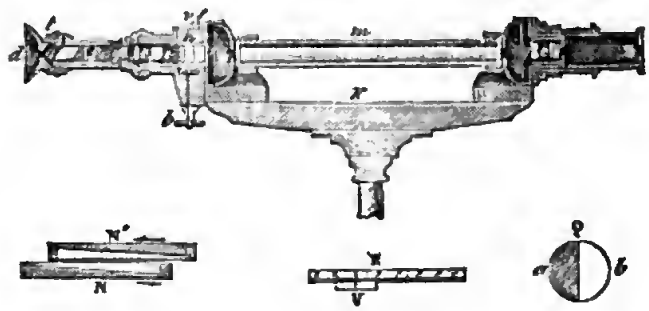


Fig. 354.

Fig. 355.

Fig. 356.

is, that when we make the experiment with white light, the fringes of each simple colour being separated by their unequal dilation, those which are formed on the screen *a* exhibit all the colours of the rainbow.

If, instead of interposing between the lens *L* and the screen *b* the edges of an opaque body, we put an opaque body which is very narrow, as *e. g.* a hair or a fine metallic thread, we not only still observe the alternately dark and bright fringes on both sides of the portion of the screen which corresponds to the geometrical shadow of the body, but even in this shadow we perceive the same alternations of dark and bright bands, that is to say, exterior and interior fringes are then produced.

It was Father Grimaldi, of Bologna, who first made known the phenomenon of diffraction and fringes, in 1663, but without giving any explanation of it. Newton tried to explain diffraction in accordance with his theory of the diffusion of light by the emission of rays, but did not account for the interior fringes. Thomas Young also failed to give a satisfactory explanation, but Fresnel explained all the phenomena in accordance with the theory of luminous undulations.

Interferences.—This name is given to the mutual action of luminous rays when, having been emitted from the same source, they meet at a very small angle. This action may be easily observed by the following experiment. Through two very small circular apertures of the same diameter and very near each other, two pencils of homogeneous light—as red light, for example—are introduced into a *camera obscura*, which is accomplished by placing red glasses at the openings so as

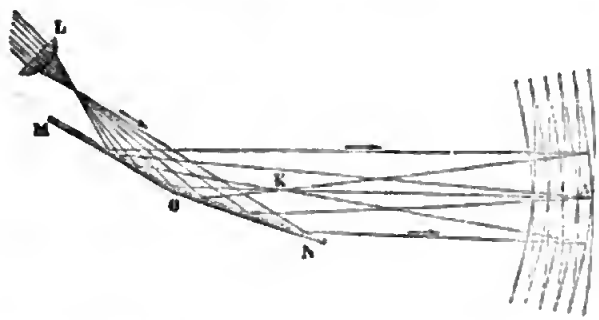
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to let none but red light through. The two pencils forming, after their entrance into the chamber, two luminous cones, which meet at a certain distance, are received a little beyond the point of their meeting on white paper, and in the common segment of the two discs formed upon this screen, fringes are then observed of remarkable darkness, forming alternations of red and black. But if we close one of the apertures, the fringes disappear, and are replaced by a pretty uniform red tint. From the disappearance of the dark fringes on closing one aperture and intercepting one of the pencils, we conclude that they are the result of the meeting of the two pencils which cross one another obliquely.

This experiment we owe to Grimaldi, who drew from it the remarkable inference, that light added to light produces darkness. In the above experiment there is diffraction because the rays graze the edges of the openings; but without this phenomenon two pencils may be made to interfere by means of the following apparatus of Fresnel.

Two plane metal mirrors M and N (fig. 358) are placed side by side in such a manner as to form a very obtuse angle MON. A semi-cylindrical lens L, with short focal distance, concentrates in front of the mirrors a pencil of red light introduced into a *camera obscura*, which falls partly on one of the mirrors and partly on the other. The luminous waves, after having been reflected, meet at a very small angle, as seen in the figure, nearer the mirror N than M'; and if they are then received on a white screen, we observe upon it bands alternately dark and bright, parallel to the line of intersection of the two mirrors, and symmetrically arranged on both sides of the plane O K A, which passes through the line of intersection of the mirrors and bisects the angle which the reflected rays form with one another. If we stop the light from falling on one of the mirrors, the fringes disappear as in the preceding experiment. Lastly, if we make the pencil, after being reflected by one of the mirrors, pass through a plate of glass with parallel surfaces, all the fringes are removed to the right or left, at a distance proportional to the thickness of the plate. This last experiment shows that the mutual action of the rays which meet is modified by the substance through which they pass, and it has been hence inferred that light is diffused less rapidly through glass than air.

Fig. 358.



Colours of Thin Plates; Newton's Rings.—All diaphanous bodies, whether solid, liquid, or gaseous, on being reduced to sufficiently thin plates, appear coloured with extremely bright tints, especially by reflection. Crystals which split into very thin leaves, as mica and gypsum, present this phenomenon; so also do mother-of-pearl and glass when blown into very thin balls. A drop of oil suddenly let fall into a large quantity of water exhibits the same colours of the spectrum in a constant order. A soap bubble appears white at first, but, as we keep on blowing it, we see beautiful rainbow tints appear, especially at the upper part, where the liquid is thinnest. These colours are arranged in concentric horizontal zones round the top, which becomes black when there is no longer thickness enough to reflect the light, and the bubble suddenly bursts.

Newton was the first who studied the phenomenon of coloured rings in soap-bubbles. Wishing to ascertain the relation existing between the thickness of the thin plate, the colour of the rings, and their size, he produced them by means of a layer of air between two glasses, the one plane and the other convex, with very long focal distance (fig. 359). If the two surfaces have been very carefully wiped and exposed to

Fig. 359.



Fig. 360.



daylight at a window, in such a manner as to see them by reflection, we perceive at the point of contact a black spot surrounded with coloured rings to the number of six or seven, the colours of which gradually grow feebler. If the glasses are seen by transmission, the centre of the rings is white (fig. 360), and the colours of each of them are exactly complementary of those of the rings seen by reflection. With a homogeneous light, as *e. g.* red, the rings are successively black and red, and with a diameter smaller in proportion to the refrangibility of the colour. But with white light the rings are coloured with the different colours of the spectrum. If the focal distance of the lens (fig. 359) is from ten to thirteen feet, the rings may be observed with the naked eye; but if the focus is nearer, we must look at the rings through a lens.

The colouring of thin plates and Newton's rings is an instance of the phenomenon of interference.

LESSONS IN MORAL SCIENCE.—No. II.

WHETHER CONSCIENCE IS THE SAME AS THE UNDERSTANDING, OR A FACULTY DIFFERENT FROM AND INDEPENDENT OF IT.

Some have maintained that our moral feelings and judgments are the exercise of a peculiar sense, and that the perceptions and feelings of this sense cannot be referred to the understanding. Such as maintain this theory suppose, also, that the dictates of conscience are infallibly correct, if the mind is in a proper state.

Others have maintained that the dictates of conscience are the judgments of the understanding, in regard to moral duty, and that, of course, an error in the judgment or the understanding must effect the decisions or dictates of conscience. To clear this subject, if possible, from all obscurity and perplexity, we will make the following remarks:

1. The exercise of the moral faculty, or conscience, is not simply an intellectual act; it is complex, including two

things—a judgment and an emotion, or feeling of a peculiar kind.

2. All judgments of the mind, whatever be the subjects of them, appertain to the understanding. This comprehensive faculty includes all intellectual acts, whether relating to external objects, mathematical relations, natural beauty and sublimity, or moral duty. So far, therefore, as conscience is a judgment respecting any moral subject, so far it is an exercise of the understanding. We have not one faculty by which we discern physical truths, another by which we judge of mathematical theorems, and another for matters of taste; but all these are the one and the same understanding, exercised on different objects. Accordingly, when moral qualities are the objects of our contemplation, it is not a different faculty from the reason or understanding which thinks and judges, but the same, exercised on other subjects; and the only difference is in the object. Our conclusion therefore is, that so far as conscience is an intellectual act or judgment of the mind, so far it belongs to the understanding.

3. But as more is included under the name *conscience* than a mere intellectual act or judgment, and as this judgment is attended with a peculiar feeling, called moral, and easily distinguished from all other emotions; and as mere emotion or feeling can with no propriety be referred to the reason, therefore conscience is, so far as this is concerned, different from the understanding.

4. If the moral judgments of the mind proceeded from a faculty distinct from the understanding, and often differing from it, the harmony of the mental operations would be destroyed. While reason led to one conclusion, conscience might dictate the contrary. And upon this theory, conscience must always be correct, unless the faculty be morbid.

All experience and history show that men may act under the influence of an erroneous conscience. The dictates of conscience are always in conformity with the practical judgments of reason. When these are erroneous, conscience is erroneous. The conclusion therefore is, that conscience is not a distinct faculty from reason, so far as it consists in a judgment of the quality of moral acts. Reason or understanding is the genus; the judgments of conscience are the species. Reason has relation to all intelligible subjects; the moral faculty is conversant about moral qualities alone.

THE MORAL SENSE COMPARED WITH THE TASTE.

From what was said in the preceding remarks it appears that conscience, or the moral sense, is not a simple but a compound faculty, including both an intellectual act or judgment, and a peculiar feeling or emotion. The name moral sense was probably adopted to express this feeling, or internal emotion. It will serve perhaps to illustrate this subject, if we bring into view another faculty, between which and the moral sense there is a remarkable analogy. I refer to what is commonly called Taste, or that faculty by which men are in some degree capable of perceiving and relishing the beauties of nature and art. In this there is a judgment respecting that quality denominated Beauty, but there is also a vivid emotion of a peculiar kind accompanying this judgment. The external objects in which beauty is resident might be distinctly seen, and yet no such quality be perceived; as was before mentioned in regard to certain animals, whose sight and hearing are more acute than those of men, and which yet appear to be utterly insensible of the quality called beauty.

If the question should be raised whether Taste is merely an exercise of the understanding, the proper answer would be precisely as in the case of conscience, viz., so far as it consists in judgment, it appertains to the intellectual faculty; but so far as it consists in emotion, it does not. And in this as in matters of conscience, errors of judgment will affect the emotions produced. In cultivating Taste, it is of the utmost importance that correct opinions be adopted in relation to the objects of this faculty.

The question may perhaps be asked, why either of these should be considered a distinct faculty of the mind. In regard to mental faculties or powers, there is a want of agreement among philosophers, as to what is requisite to entitle any mental operation to be referred to a distinct and original faculty. In these two cases, there exists in the mind a capacity for perceiving peculiar qualities in certain appropriate objects. Though the ideas of beauty and morality are judgments of the understanding, it requires a faculty suited to the objects to enable the understanding to obtain the simple ideas of beauty and morality. We can conceive of a rational mind without such a capacity. There is also in these faculties, the susceptibility of a peculiar emotion, dissimilar from all others; and these two things constitute the faculty of Taste or Conscience. But it is a matter of no importance whether taste and conscience be called distinct and original faculties, if what has been said respecting their nature be admitted.

There is in the human mind a capacity of discerning what is termed beauty, in the works of nature and art. This judgment is accompanied by a pleasurable emotion, and to this capacity or susceptibility we give the name Taste. There is also a power of discerning moral qualities, which perception is also attended with a vivid emotion; and to this power or faculty we give the name Conscience, or the moral faculty. Both these are so far original parts of our constitution, that if there did not exist in every mind a sense of beauty and its contrary, and a sense of right and wrong, such ideas could not be generated or communicated by any process of education.

MORAL OBLIGATION.

Much has been written to explain the true ground of moral obligation. But the subject has been rather darkened and perplexed than elucidated by these comments. It is always so when men undertake to explain that which is so clear that it needs no explanation.

Every idea of morality includes in it that of moral obligation. A moral act is one which ought to be performed; an immoral act is one which ought not to be performed. As soon as we get the conception of a moral act, we receive with it the idea of moral obligation. It would be a contradiction to say that any act was moral, and yet that there was no obligation to perform it. One of the best definitions which can be given of a moral act is, that it is an act which we are bound to perform, and of an immoral act, that it is one which ought not to be done. The more clearly we see anything to be moral, the more sensibly we feel ourselves under a moral obligation to perform it. This being a matter of common intuition and universal experience, all that is necessary to convince us of its truth, is to bring it distinctly before our minds. There is therefore no need to look any further for the grounds and reasons of moral obligation, than to the morality of the act itself, as this idea is involved in every conception of morality.

The following citation from Dr. Price's work on Morals is in accordance with the view just given: "From the account given of obligation, it appears how absurd it is to inquire, what *obliges* us to practise virtue? as if obligation were no part of the idea of virtue, but something adventitious and foreign to it: that is, as if what was our duty might not be our duty; as if it might not be true, that what is *fit* to do, we *ought* to do, and that what we ought to do, we are obliged to do. To ask *why* we are *obliged* to practise virtue, to abstain from what is wicked, or perform what is just, is the very same as to ask why we are obliged to do what we are obliged to do. It is not possible to avoid wondering at those who have so unaccountably embarrassed themselves on a subject that one would think was attended with so little difficulty: and who, because they cannot find any thing in virtue and duty themselves, which can induce and oblige us to pay a regard to them—fly to self-love, and maintain that from hence alone are derived all inducement and obligation." Dr. Paley commences his second book on Moral Philosophy by an inquiry into the nature of moral obligation. He asks, "Why am I obliged to keep my word?" and mentions several answers which would be given by different persons, and which he says all coincide. But he goes on to say that all the answers leave the matter short; for the inquirer may turn round upon his teacher with a second question, "*Why* am I obliged to do what is right, to act agreeably to the fitness of things, to conform to reason, nature or truth, to promote the public good, or to do the will of God?"

All this, it appears to us, is fitted to mystify as plain a subject as ever engaged the thoughts of a rational mind, and is designed to remove the true ground of moral obligation, and

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reduce all such obligation to the single principle of self-love, or the tendency of an act to promote individual happiness.

Suppose that, after Dr. Paley had made all obligation to rest on the ground that the performance of a good act promotes our eternal happiness, the inquirer should again ask, "Why am I bound to perform that which will promote my happiness?" The question, indeed, would be unreasonable, because all men are agreed that happiness is a good; but is it not equally unreasonable, when an action is seen to be virtuous, or morally right, to ask "Why am I obliged to do it?" The moment we see a thing to be morally right, the sense of obligation is complete, and all further inquiring for reasons why am I obliged to do right is as absurd as would be inquiring for reasons why I should pursue happiness.

Where we have intuitive certainty of any thing it is foolish to seek for other reasons. If there is anything clear in the view of a rational mind, it is this: that virtue should be practised, that what is right should be done. But still further to perplex this plain subject, Dr. Paley has undertaken to inform us what is meant by obligation. "A man," says he, "is said to be obliged when he is urged by a violent motive resulting from the will of another."

This is, indeed, a very extraordinary definition. The motive he says must be violent; but why may not a motive which is not violent create an obligation according to its force? The main error of this definition is, that it confounds moral obligation with other motives of an entirely different kind. The obligation of which he speaks is created by the will or command of another. The law of a tyrant requiring his subjects to do what is evidently wrong cannot create a moral obligation. A rational being may be urged by the threats of a tyrant, on the universal principle of self-love, and this force may, by an abuse of terms, be called an obligation; but according to the common usage of the language, when a man is said to be under obligation to perform an act, we mean that he is morally bound. But whether the operation of any violent motive, resulting from the will of another, may be said to oblige a man or not, the main inquiry is, what is the ground of moral obligation? The difference between a moral obligation and other motives which may oblige should be kept in view.

He then returns to the question, "Why am I obliged to keep my word?" and applies the preceding definition of the nature of obligation, and gives the following answer: "Because I am urged to do so by a violent motive (namely, the expectation of being after this life rewarded if I do, or punished if I do not), resulting from the command of another (namely, of God)." He goes on to say, "When I first turned my attention to moral speculations, an air of mystery seemed to hang over the whole subject, which arose, I believe, from hence; that I supposed with many authors whom I had consulted that to be *obliged* to do a thing, was different from being *induced* to do it; and that the obligation to practise virtue, and to do what is justice, is quite another thing and of another kind from the obligation which a soldier is under to obey his officer, or a servant his master, or any of the ordinary obligations of human life."

We cannot but be of the opinion that Dr. Paley has here made a radical mistake, which it is exceedingly important to consider, since, unhappily for sound morals, his system is so much employed in the instruction of youth.

The theory of morals, of which the above principle is a part, is no other than this: that the only difference between virtue and vice consists in their tendency, respectively, to promote or hinder the happiness of the individual; so that if a man could persuade himself that no evil would arise to him from telling a lie, he would be under no obligation to speak the truth. It is a scheme of morals which obliterates all intrinsic difference between virtue and vice, and makes the one preferable to the other on no other account than its tendency to promote individual happiness in the future world.

If a man does not believe in a future world, he can, according to this theory, feel no obligation to keep his word. We believe, on the contrary, that moral obligation is felt by the atheist, and that he cannot divest himself of it. When men are tempted by some strong motive to deviate from the truth, and yet are enabled to resist the temptation, there is in most cases no distinct consideration of any future good to be gained by it, but the man feels himself under an obligation to do that which is in itself right. The conflict is not between a greater and a less happiness, but between the prospect of happiness and moral obligation.

On this subject, the appeal must be to the common judgment of men. And we are persuaded that this confounding of moral obligation with motives of another kind, is a radical defect in Dr. Paley's system, which—lying at the foundation—vitiates the whole, and has already been the cause of great evil to society.

The true doctrine is, that virtue and vice are distinct and opposite, and that when we know any act to be right, we are bound—apart from all considerations of self-interest—to perform it.

Dr. Paley maintains that "we can be obliged to do nothing, unless we are to lose or gain something by it, for nothing else can be a 'violent motive' to us. And as we should not be obliged to obey the laws or the magistrate, unless rewards or punishments, pleasure or pain, somehow or other depended on our obedience; so neither should we, without the same reason, be obliged to do what is right, to practise virtue, or to obey the command of God."

According to this view, unless a man is persuaded that he shall gain something by keeping his word, he is under no obligation to do it. Even if God should clearly make known his will, and lay upon him his command, he is under no obligation to obey, unless certain that he shall receive benefit by so doing. This is, indeed, to make virtue a mercenary thing, and reduce all motives to a level. And as self-love, or the desire of happiness, is the only rational motive, and all men possess this in a sufficient degree of strength, the only conceivable difference between the good and the bad consists in the superior sagacity which the one has above the other to discern what will most contribute to happiness. And if what we call vice or sin could be made to contribute to happiness, then it would change its nature and become virtue.

The definition of obligation, given by Dr. Paley, upon his own principles, is unnecessarily encumbered with what adds nothing to its import. Why should the "violent motive" result from the command of another? The command of another ought to have no influence, except as obedience or disobedience will be attended with loss or gain. It would, therefore, have been more simple and intelligible to say at once, what is certainly implied, that the only motive which can oblige us to be virtuous, is the expectation of the happiness to be derived from such conduct in the future world.

Cicero, in his work "De Finibus," says that those men who confounded the *honestum* with the *utile*, deserve to be banished from society. The result of the whole scheme is, that there is no such thing as moral excellence, abstractedly considered; that the only good in the universe is happiness; and that other things, among which virtue is included, are good only as related to this end. If this is true, the moral attributes of God have no intrinsic excellence; they are all merged in his infinite felicity. Surely this view is not suited to increase our reverence for the Supreme Being.

But every man who carefully examines into his own primary ideas of morality, will find that he has a sense of right and wrong, independent of all considerations of personal happiness, or its loss. This distinction is too deeply engraven on the mind to be erased by any process of reasoning.

THE SUPREMACY OF CONSCIENCE.

That the dictates of conscience should be obeyed, is one of the most evident convictions of the human mind. No matter how much might be gained by going contrary to conscience, every honest mind has the same judgment, that duty should be done. If it is plain that a certain act—such as confessing the truth of the gospel—is a duty, and we are convinced that nothing but suffering will ensue from performing it; yet the judgment of the impartial mind is, that no prospect of pain or loss can ever justify us in denying the truth, or in doing any thing else that we know to be wrong. On this point there is no room for reasoning. The judgment that conscience should be obeyed is intuitive: all men must acknowledge it, unless they belie the clear convictions of their own reason.

That conscience should be obeyed, that duty should be performed at every risk, are maxims which must receive the assent of all who are capable of understanding them. On

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the subject of the supremacy of conscience, the following quotation from Dr. Chalmers is very much to our purpose:

"In every human heart there is a faculty—not, it may be, having the actual power, but having the just and rightful pretension to act as judge and master over the whole of human conduct. Other propensities may have too much sway, but the moral propensity—if I may so term it—never can; for, to have the presiding sway in all our concerns, is just that which properly and legitimately belongs to it. A man under anger may be too strongly prompted to deeds of retaliation, or under sensuality may be too strongly prompted to indulgence, or under avarice, be too closely addicted to the pursuit of wealth, or even under friendship be too strongly inclined to partiality; but he never can, under conscience, be too strongly inclined to be as he ought, and to do as he ought. We may say of a watch, that its main-spring is too powerful, but we would never say that a regulator was too powerful." "And neither do we urge the proposition that conscience has in every instance the actual direction of human affairs, for this were in the face of all experience. It is not that every man obeys her dictates, but that every man feels that he ought to obey them. These dictates are often, in life and practice, disregarded; so that conscience is not the sovereign *de facto*. Still there is a voice within the hearts of all which asserts that conscience is the sovereign *de jure*: that to her belongs the command rightfully, even though she do not possess it actually." "All that we affirm is, that if conscience prevail over the other principles, then every man is led, by the very make and mechanism of his eternal economy, to feel, that it is as it ought to be; or if these others prevail over conscience, that it is not as it ought to be." "When stating the supremacy of conscience, in the sense that we have explained it, we but state what all men feel; and our only argument in proof of the assertion is—our only argument can be, an appeal to the experience of all men."

These sentiments will find a response in every honest mind. However often we disobey the voice of this monitor, we always have the feeling of self-condemnation accompanying our disobedience.

LESSONS IN FRENCH PRONUNCIATION.—No. II.

NAME AND SOUND OF THE VOWELS.

33 A a.

Name. Sound

AH. Like the letter A in the English word MARK.

Pronounce this English word—MARK, aloud several times, with strict reference to the sound of the French letter A, until you are sure of having its correct sound.

The sound thus obtained, always belongs to the French letter A in the alphabet, that is, whenever the French alphabet is repeated, always give the first letter the sound of A in the English word MARK, that is, AH.

But the French A does not *always* and *invariably* have this sound whenever and wherever it is used in a French word.

Its sound depends upon its *position* in a word and upon the *accent* under which it is placed, either by itself, as constituting a single word, or within a word of one or more syllables.

The letter A has, then, another sound which we illustrate by the sound of the letter A in the English word FAT. Pronounce this English word—FAT, aloud several times with strict reference to the sound of the French letter A, until you are sure of having its correct sound.

The French letter A has, therefore, two distinct sounds, viz.:—Short sound in the English word FAT.

Long sound in the English word MARK.

In these lessons, the English letter A will be used to illustrate the short sound of the French vowel A; and AH will be used to illustrate the long sound of the French vowel A.

A, has the short sound represented by A in the English word FAT, when it is a word by itself, and *generally* when it begins or ends a French word. There are exceptions to this rule; but they will be readily noticed by the reader in the spelling by means of English letters, designed to illustrate the pronunciation of a given French word.

A, has the long sound represented by A in the English word MARK, when it is pronounced as the first letter of the French alphabet, and also when under the Circumflex accent, which will be illustrated hereafter.

Exercise upon the short sound of the French vowel A, in the following examples. Pronounce every French word in the following table aloud, and, when possible, always study your French lessons aloud.

French.	Pronunciation.	English.
Abaca	A-ba-ke	*Manilla Hemp.*
Alarme	A-larm	*Alarm.*
Bal	Bal	*Ball*
Caresse	Ka-ress	*Endearment.*
Dame	Da-m	*Married Woman.*
Lama	La-ma	*Lama.*
Masque	Mas-k	*Mask.*

The above examples are introduced to illustrate the short sound of the French vowel A. In the first word (Abaca), be careful not to pronounce it *Ay-bay-kay*; but give each A in each syllable, the sound of A in the English word FAT. In the next word, do not say *Ay-lahrm*; remember to give the sound of A in the English word FAT. Trill the R in the last syllable of the word *A-larm*. It will be perceived the final E of this word (*A-larme*) is not sounded.

This vowel is sometimes under a Grave accent; thus, à, là, voilà; but its sound is not materially affected thereby.

34. Â â.

Under the Circumflex accent, this vowel has the long sound represented by A in the English word MARK, and is named AH. It has, besides, a little more than the sound just spoken of, for the sound must be prolonged, and in order to do this conveniently, the mouth must be opened a little wider than in uttering its short sound, represented by A in the English word FAT.

Be careful, however, not to pronounce Â â, like the sound of the English word AWE, but give it the sound of AH prolonged, in the following examples, viz.:—

French.	Pronunciation.	English.
Âge	Ah-eh	*Age.*
Âme	Ah-m	*Soul.*
Bâche	Bah-sh	*Awning.*
Bâfre	Bah-fr'	*Gormandising.*
Bât	Bah	*Pack-saddle.*
Câpre	Kah-pr'	*Caper*
Grâce	Grah-s	*Favour.*
Mâle	Mah-l	*Male*
Mâsse	Mah-s	*Stake* (in betting).
Pâle	Pah-l	*Pale.*
Rabâchage	Ra-hah-shash	*Repetition.*

35. E e.

Name. Sound.

AY. Like the letters AY in the English word DAY.

Pronounce aloud the word DAY, until you have a distinct idea of the single sound of the combination of the letters AY; and then pronounce the word without the D, viz.:—

DAY, AY,

and thus you have the sound of the vowel E, which deserves the most particular attention of the pupil, because of its importance in the French language. It is used more than any other letter, viz.:—in five different ways, and hence it has five different names, viz.:—

E Silent, E Mute or Unaccented, É Acute, È Grave, and Ê Circumflex.

36. E e SILENT.

When final, and unaccented in words of more than one syllable, E is silent, viz.:—

English.	Pronunciation.	French.
Abaque	A-bak.	*Abacus.*
Abatage	A-ba-tazh	*Killing.*

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French.	Pronunciation.	English.
Algarade	Al-ga-rad	*Insult*
Approche	A-piosh	*Approach*
Article	Ar-teekl'	*Thing.*
Ballotte	Ba-lot	*Ballot.*
Domestique	Do-mes-teck	*Domestic.*
Passage	Pah-saah	*Passage.*
Possible	Po-see-bl'	*Possible*
Spectacle	Spek-ta-kl'	*Sight*
Terrible	Ter-reebl'	*Awful.*
Véritable	Vay-ri-tabl'	*Genuine.*

In the following words, the E is silent, viz.:—

Celui	pronounced	S'lwee.
Cela	"	S'la or S'lah.
Prierai	"	Pre-ray.

Again in the following words, the middle E is silent, viz.:—

Autrement, Entrevoir, and Paiement, etc.

In the word Contenance both E's are silent; ordinarily, the E before A and O is silent, viz.:—

Jean and Georges.

37. E a Mute or Unaccented.

Before proceeding to the illustration of the sound and use of E mute or unaccented, let us commend the following extract to the careful perusal of the pupil. Speaking of the unaccented E, it is said,—"Several of our best orthoepists express themselves thus on that subject:—'The proper utterance of the unaccented E characterises, in part, the pronunciation of the gentleman, as a vicious one marks the low-bred and ignorant. The unaccented E is sometimes pronounced and sometimes not; and in that consists a great difficulty for foreigners, who, always pronouncing it full, are long before they are able to follow a French conversation, and thence are inclined to believe that the French speak much faster than any other people. The truth is, that the French, taking them in general, do not speak faster than other people; but, in conversation and in familiar reading, they drop the unaccented E as often as they can do it, and thus go quicker through a sentence than does a foreigner, who gives the full sound of U in TUB to every unaccented E he meets with. Thus the word *Contenance*, and the phrase *je n'ai pas reçu tout le vêtement*, will be pronounced by a foreigner and a Frenchman native of Gascony,—*Con-te-nan-ce—je ne pa re-çu tou le vê-te-men*; whereas a well-bred Frenchman will pronounce—*cont-nans,—jné pa reu toul vêt-men*, sounding in the first word two syllables only, where the others would sound four; and in the sentence, sounding six syllables, where the others would sound ten.'"

The French custom of clipping or shortening words as much as possible, in ordinary reading and common conversation, is well illustrated in the following sentence, viz.:—

"Quand vous serez le même, vous me trouverez le même."

This sentence contains thirteen syllables in prose, viz.:—*Quand-vous-se rez-le-même-vous-me-trou-ve-rez-le-même.* In poetry, *même* would have two syllables. However, in familiar reading and conversation, it is pronounced in eight syllables only, viz.:—Quand-vou-srel-même-voum-trouv-rel-même. The suppression of this E is precisely the reason why foreigners imagine that the French speak so very quickly.

E e Mute ou Unaccentad.

Name. Sound.

UH! Like the sound of the letter U in the English word NUT; or, like the sound of the last syllable ER in the words OVER and WATER, when spoken quickly.

The E mute or unaccented, "is a mere emission of the voice without any distinct sound. It either succeeds a consonant, by the articulation of which it becomes sensible, or comes after a vowel, of which it may be considered the prolongation."

It is confessedly difficult to illustrate the sound of this vowel by the aid of English letters; yet it is worthy an honest attempt. True, it may be acquired from a teacher, by *sheer imitation*; but alas, all learners are not good imitators! If it can be illustrated by analogous English sounds, it seems quite reasonable to suppose that through *this* process, many more students would understand and acquire it, than if they were left merely to the doubtful policy of imitation. Let us try.

Before the pupil attempts to pronounce the French words used for examples, let him observe most carefully the sound of the last syllable of the following words, when uttered as they usually are, in common conversation, viz.:—

Moth-er! Broth-er! Nev-er! Sis-ter! Wa-ter!

Take any one of the above English words, viz.:—the first —Moth-er! Pronounce it *naturally* and aloud with a full voice several times, until the common sound *of the last syllable in particular*, is familiar to the ear. Take each of those words and thus practice, by pronouncing aloud carefully, but naturally; observing at the same time THE SOUND OF THE LAST SYLLABLE.

Now, by what combination of letters would you represent that *sound?* By UR, as in the first syllable of the English word *Mur-mur?* Or, by UH!? Manifestly the latter. Below are a few French words, which you will now proceed to pronounce aloud, giving to the vowel E in each example, the last syllable of the word Nev-er! Pronounce each of the following French words quickly and abruptly, as if an exclamation mark were placed over each one of them, viz.:—

Ce like suh!	That is, a combination of the letter S, with the usual sound of the last syllable of the English word Moth-er!
De like duh!	That is, a combination of the letter D, with the usual sound of the last syllable of the same word Moth-er!
Je like shuh!	That is, a combination of the letters ZH, with the same sound mentioned in the first example; or, like the sound of the last syllable of the word Pleas-ure! as usually pronounced, but without the sound of the Y, which is sometimes heard; i.e., *peas-ure!* and not *pleas-yure!*
Le like luh!	That is, a combination of the letter L, with the same sound mentioned in the first example.
Me like muh;	That is, a combination of the letter M, with the same sound mentioned in the first example; or like the sound of MU in the first syllable of the English word Mutter.
Ne like nuh!	That is, a combination of the letter N, with the sound mentioned in the first example; or, like the sound of NU in the English word Nut. Pronounce NU in the word NUT, and you have the correct pronunciation of the French word NE.
Se like suh!	That is, exactly like the pronunciation of CE as given in the first example.
Te like tuh!	That is, exactly like the sound of the last syllable of the English word Water!
Que like kuh!	That is, like the sound of the last syllable of the English word Baker, pronounced rather carelessly

Take, if you please, another illustration, viz.:—the sound of U in the English word NUT, as explained above, in illustrating the sound of the French word NE. This will give the correct sound of E mute or unaccented.

The sound of E mute or unaccented, resembles the sound of the letter E of the word THE, which is heard in pronouncing *quickly* these two words, viz.:—The Man. Apply the sound of this E thus pronounced, to the E in the following words, viz.:—Ce, De, Je, Me, Ne, Se, Te, Que, etc.

Or lastly,—the sound of E mute or unaccented, is based upon the sound of English A pronounced naturally. Let the organs within the mouth maintain as nearly as possible the same position, whilst the lips are protruded as if to *pout* or *whistle*. Then, whilst the mouth is in this position, endeavour to pronounce English A again; this, in a majority of cases, will give the correct sound of E mute or unaccented. Practise

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frequently on this last-mentioned plan aloud, and the ear will soon detect the viciousness or correctness of the sound. Most pupils who are not good imitators of sound, find more or less difficulty in acquiring *this* sound; but patient perseverance will, in due time, overcome every obstacle.

In illustrating the sound of E mute or unaccented, the following signs will be used, sometimes one, again the other, viz., UH!, and the Apostrophe, thus:—

Je by Zhuh! or by J'
Se " Suh! " S'

38. É é Acute.

Name.	Sound.
AY	Like the letters AY in the English word PRAY.

EXAMPLES.

French.	Pronunciation.	English.
Arrivé	A-re-vay	*Arrived.*
Elevé	Ayl-vay	*Raised.*
Ému	Ay-toy	*Summer.*
Flagorné	Fla-gor-nay	*Wheedled.*
Forgé	For-zhay	*Forged.*
Joué	Zhoo-ay	*Sported.*
Mérite	May-reet	*Worth.*
Obligé	O-ble-zhay	*Obliged.*
Précéder	Pray-say-day	*To precede*
Préméditè	Pray-may-dee-tay	*Premiditated.*
Trouvé	Troo-vay	*Found.*
Vérité	Vay-ree-tay	*Truth.*

39 È è Grave.

Name.	Sound.
AI	Like the letters AI in the English word STAIR.

EXAMPLES.

French.	Pronunciation.	English.
Chère	Shair	*Cheer.*
Colère	Ko-lair	*Passionate.*
Elève	Ay-laiv	*Pupil.*
Fièvre	Fai-vr'	*Fever.*
Jardinière	Zhar-de-neair	*Gardener.*
Manière	Ma-neair	*Manner*
Madère	Ma-dair	*Madeira.*
Mère	Mair	*Mother.*
Modèle	Mo-dril	*Pattern.*
Père	Pair	*Father.*
Retière	Ra-teair	*Rat-trap.*

40. Ê ê Circumflex.

Name.	Sound.
AI	Like the letters AI in the English word STAIR.

Ê has a longer and broader sound than È. The mouth must be opened wider in pronouncing the former than the latter. In ordinary reading and common conversation, the difference between Ê and È is hardly perceptible. Still there is a difference; just the difference betwen pronouncing E like the letters AI in the English word STAIR with the mouth half opened, and pronouncing the same letters in the same word with the mouth well opened, and also prolonging the sound. Practice will demonstrate this, viz.:—

EXAMPLES.

French.	Pronunciation.	English.
Bête	Beit	*A beast.*
Crême	Kraim	*Cream.*
Crêpe	Kraip	*Crape.*
Dépêche	Day-paish	*Dispatch.*
Être	Aitr'	*To be.*
Extrême	Eks-traim	*Extreme.*
Forêt	Fo-rai	*Forest.*
Même	Maim	*The same.*
Prêcher	Prai-ebe	*To preach.*
Prêt	Prai	*Ready.*
Rêve	Raiv	*Dream.*
Tête	Teit	*Head.*

Open the mouth wide, and prolong the sound.

LESSONS IN ALGEBRA.—No. XXII.

(*Continued from page* 11.)

ADDITION OF RADICAL QUANTITIES.

It may be proper to remark, that the rules for addition, subtraction, multiplication, and division of *radical quantities* depend on the *same principles*, and are expressed in nearly the same language, as those for addition, subtraction, multiplication, and division of *powers*. So also the rules for involution and evolution of radicals, are *similar* to those for involution and evolution of powers. Hence, if the learner has made himself thoroughly acquainted with the principles and operations relating to powers, he has substantially acquired those pertaining to radical quantities, and will find no difficulty in understanding and applying them.

When radical quantities have the *same radical part*, and are under the *same radical sign* or *index*, they are *like* quantities. Hence their *rational parts* or *co-efficients* may be added in the same manner as *rational* quantities, and the sum prefixed to the *radical* part.

Thus, $2\sqrt{b} + 3\sqrt{b} = 5\sqrt{b}$.

1. Add $^n\sqrt{ay}$ to $2\,^n\sqrt{ay}$.
2. Add $-2\sqrt{a}$ to $5\sqrt{a}$.
3. Add $4(x+h)^{\frac{1}{2}}$ to $3(x+h)^{\frac{1}{2}}$.
4. Add $7bh^{\frac{1}{2}}$ to $6bh^{\frac{1}{2}}$.
5. Add $y\sqrt{b-h}$ to $a\sqrt{b-h}$.

If the radical parts are originally different, they may sometimes be made alike, by the rules for reduction of radical quantities.

6. Add $\sqrt{8}$ to $\sqrt{50}$.

 Here the radical parts are not the same. But by reduction, $\sqrt{8} = 2\sqrt{2}$, and $\sqrt{50} = 5\sqrt{2}$. And $2\sqrt{2} + 5\sqrt{2} = 7\sqrt{2}$. Ans.

7. Add $\sqrt{16b}$ to $\sqrt{4b}$.
8. Add $\sqrt{a^2x}$ to $\sqrt{b^2x}$.
9. Add $(36a^2y)^{\frac{1}{2}}$ to $(25y)^{\frac{1}{2}}$.
10. Add $\sqrt{18a}$ to $3\sqrt{2a}$.

If the radical parts, after reduction, are *different*, or have *different exponents*, then the quantities being *unlike*, can be added only by writing them one after the other with their signs.

11. The sum of $3\sqrt{b}$ and $2\sqrt{a}$, is $3\sqrt{b} + 2\sqrt{a}$.

 It is manifest that three times the root of b, and twice the root of a, are neither five times the root of b, nor five times the root of a, unless b and a are equal.

12. The sum of $^2\sqrt{a}$ and $^3\sqrt{a}$, is $^2\sqrt{a} + {}^3\sqrt{a}$.

 The *square* root of a, and the *cube* root of a, are neither twice the square root, nor twice the cube root of a.

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From the preceding principles we deduce the following—

GENERAL RULES FOR ADDITION OF RADICALS.

If the radical parts are the same, add their co-efficients, and to the sum annex the common radical parts.

If the radicals are unlike quantities, they must be added by writing them, one after another, without altering their signs.

EXAMPLES FOR PRACTICE.

1. Add $\sqrt{27}$ to $\sqrt{48}$.
2. Add $\sqrt{72}$ to $\sqrt{128}$.
3. Add $\sqrt{180}$ to $\sqrt{405}$.
4. Add $3\sqrt[3]{40}$ to $\sqrt[3]{135}$.
5. Add $4\sqrt[3]{54}$ to $5\sqrt[3]{128}$.
6. Add $9\sqrt{243}$ to $10\sqrt{363}$.
7. Add $\sqrt{81b}$ to $\sqrt{49b}$.
8. Add $\sqrt{9a^2d}$ to $\sqrt{16a^2d}$
9. Add $x\sqrt{25x^2c}$ to $\sqrt{36x^4c}$.
10. Add $3\sqrt[3]{a^4b}$ to $4a\sqrt[3]{a^3b}$.

SUBTRACTION OF RADICAL QUANTITIES.

RULE.—*Subtraction of radicals is performed in the same manner as addition, except that the signs of the subtrahend must be changed as in subtraction of other quantities.*

1. From $\sqrt{ay}$ take $3\sqrt{ay}$. Ans. $-2\sqrt{ay}$.
2. From $4\sqrt[n]{a+x}$ take $3\sqrt[n]{a+x}$.
3. From $3b^{\frac{1}{2}}$ take $-5b^{\frac{1}{2}}$.
4. From $a(x+y)^{\frac{1}{2}}$ take $b(x+y)^{\frac{1}{2}}$.
5. From $-a^{\frac{1}{n}}$ take $-2a^{\frac{1}{n}}$.
6. From $\sqrt{50}$ take $\sqrt{8}$.
7. From $\sqrt[3]{b^4y}$ take $\sqrt[3]{by^4}$.
8. From $\sqrt[n]{x}$ take $\sqrt[5]{x}$.
9. From $2\sqrt{50}$ take $\sqrt{18}$.
10. From $\sqrt[3]{320}$ take $\sqrt[3]{40}$.
11. From $5\sqrt{20}$ take $3\sqrt{45}$.
12. From $\sqrt{80a^4x}$ take $\sqrt{20a^2x}$.

MULTIPLICATION OF RADICAL QUANTITIES.

Radical quantities may be multiplied, like other quantities, by writing the factors one after another, either with or without the sign of multiplication between them.

1. Thus the product of $\sqrt{a}$ into $\sqrt{b}$, is $\sqrt{a}\times\sqrt{b}$.
2. The product of $h^{\frac{1}{2}}$ into $y^{\frac{1}{2}}$, is $h^{\frac{1}{2}}y^{\frac{1}{2}}$.

But it is often expedient to bring the factors under the same radical sign. This may be done, if they are first reduced to a common index.

*Hence, quantities under the same radical sign or index may be multiplied together like rational quantities, the product being placed under the common radical sign or index.**

3. Multiply $\sqrt[3]{x}$ into $\sqrt[3]{y}$, that is, $x^{\frac{1}{3}}$ into $y^{\frac{1}{3}}$.

 The quantities reduced to the same index, are $(x^2)^{\frac{1}{6}}$, and $(y^3)^{\frac{1}{6}}$, and their product is, $(x^2y^3)^{\frac{1}{6}}=\sqrt[6]{x^2y^3}$. Ans.
4. Multiply $\sqrt{a+m}$ into $\sqrt{a-m}$.
5. Multiply $\sqrt{dx}$ into $\sqrt{hy}$.
6. Multiply $a^{\frac{1}{2}}$ into $x^{\frac{1}{3}}$.
7. Multiply $(a+y)^{\frac{1}{n}}$ into $(b+h)^{\frac{1}{n}}$.
8. Multiply $a^{\frac{1}{m}}$ into $x^{\frac{1}{n}}$.
9. Multiply $\sqrt{8xb}$ into $\sqrt{2xb}$. Prod. $\sqrt{16x^2b^2}=4xb$.

In this manner the product of radical quantities often becomes *rational*.

10. Thus the product of $\sqrt{2}$ into $\sqrt{18}=\sqrt{36}=6$. Ans.
11. Multiply $(a^2y^3)^{\frac{1}{2}}$ into $(a^2y)^{\frac{1}{3}}$.

Roots of the same letter or quantity may be multiplied, by adding their fractional exponents.

N. B. The exponents, like all other fractions, must be reduced to a common denominator before they can be united in one term.

12. Thus $a^{\frac{1}{2}}\times a^{\frac{1}{3}}=a^{\frac{3}{6}+\frac{2}{6}}=a^{\frac{5}{6}}$.

The values of the roots are not altered by reducing their indices to a common denominator.

Therefore the first factor $a^{\frac{1}{2}}=a^{\frac{3}{6}}$

And the second $a^{\frac{1}{3}}=a^{\frac{2}{6}}$

But $a^{\frac{3}{6}}=a^{\frac{1}{6}}\times a^{\frac{1}{6}}\times a^{\frac{1}{6}}$.

And $a^{\frac{2}{6}}=a^{\frac{1}{6}}\times a^{\frac{1}{6}}$.

The product therefore is $a^{\frac{1}{6}}\times a^{\frac{1}{6}}\times a^{\frac{1}{6}}\times a^{\frac{1}{6}}\times a^{\frac{1}{6}}=a^{\frac{5}{6}}$.

N.B. In all instances of this nature, the common denominator of the indices denotes a certain root; and the sum of the numerators shows how often this is to be repeated as a factor to produce the required product.

13. Thus $a^{\frac{1}{n}}\times a^{\frac{1}{m}}=a^{\frac{m}{mn}}\times a^{\frac{n}{mn}}=a^{\frac{m+n}{mn}}$.
14. Multiply $3y^{\frac{2}{3}}$ into $y^{\frac{2}{3}}$.
15. Multiply $(a+b)^{\frac{1}{2}}$ into $(a+b)^{\frac{1}{2}}$.
16. Multiply $(a-y)^{\frac{1}{n}}$ into $(a-y)^{\frac{1}{m}}$.
17. Multiply $x^{\frac{1}{2}}$ into $x^{\frac{1}{3}}$.
18. Multiply $y^{\frac{1}{2}}$ into $y^{\frac{1}{3}}$.
19. Multiply $a^{\frac{1}{n}}$ into $a^{-\frac{1}{n}}$.
20. Multiply $x^{n-\frac{1}{2}}$ into $x^{\frac{1}{2}-n}$.
21. Multiply a^2 into $a^{\frac{1}{3}}$.

Any quantities may be reduced to the form of radicals and may then be subjected to the same modes of operation.

22. Thus $y^3\times y^{\frac{1}{2}}=y^{3+\frac{1}{2}}=y^{\frac{7}{2}}$.
23. And $x\times x^{\frac{1}{n}}=x^{\frac{n+1}{n}}$

N.B. The product will become *rational* whenever the *numerator* of the index can be exactly divided by the *denominator*.

24. Thus $a^3\times a^{\frac{1}{2}}\times a^{\frac{3}{2}}=a^{\frac{7}{2}}=a^1$.
25. Multiply $(a+b)^{\frac{3}{4}}$ into $(a+b)^{-\frac{3}{4}}$
26. Multiply $a^{\frac{1}{2}}$ into $a^{\frac{1}{2}}$.

When radical quantities which are reduced to the same index, have *rational co-efficients, the rational parts may be multiplied together, and their product prefixed to the product of the radical parts.*

27. Multiply $a\sqrt{b}$ into $c\sqrt{d}$.
 The product of the rational parts is ac.
 The product of the radical parts is $\sqrt{bd}$.
 And the whole product $=ac\sqrt{bd}$. Ans.
28. Multiply $ax^{\frac{1}{2}}$ into $bd^{\frac{1}{3}}$. Ans. $ab(x^3d^2)^{\frac{1}{6}}$.

But in cases of this nature we may save the trouble of reducing to a common index, by multiplying.

29. Thus $ax^{\frac{1}{2}}$ into $bd^{\frac{1}{3}}=ax^{\frac{1}{2}}bd^{\frac{1}{3}}$. Ans.
30. Multiply $a(b+x)^{\frac{1}{2}}$ into $y(b-x)^{\frac{1}{3}}$.
31. Multiply $a\sqrt{y^2}$ into $b\sqrt{hy}$.
32. Multiply $a\sqrt{x}$ into $b\sqrt{x}$.
33. Multiply $ax^{-\frac{1}{2}}$ into $by^{-\frac{1}{2}}$.
34. Multiply $x^2\sqrt{3}$ into $y^3\sqrt{9}$.

If the rational quantities, instead of being *co-efficients* to the radical quantities, are connected with them by the signs +

* The case of an *imaginary* root of a negative quantity may be considered an exception.

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and —, each term in the multiplier must be maitiplied into each term of the muitiplicand.

35. Multiply $a+\sqrt{b}$
Into $c+\sqrt{d}$

$$ac+c\sqrt{b}$$
$$a\sqrt{d}+\sqrt{bd}$$
$$ac+c\sqrt{b}+a\sqrt{d}+\sqrt{bd}.$$ Ans.

36. Multiply $a+\sqrt{y}$ into $1+r\sqrt{y}$.
$a+\sqrt{y}+ar\sqrt{y}+ry$. Ans.

Hence we deduce the following

GENERAL RULE FOR MULTIPLYING RADICALS.

Radicals of the same root are multiplied by adding their fractional exponents.

If the quantities have the same radical sign, or index, multiply them together as you multiply rational quantities, place the product under the common radical sign, and to this prefix the product of their co-efficients.

If the radicals are compound quantities, each term in the multiplier must be multiplied into each term of the multiplicand by writing the terms one after another, either with or without the sign of multiplication between them.

EXAMPLES FOR PRACTICE.

1. Multiply $\sqrt{a}$ into $\sqrt[3]{b}$.
2. Maltiply $5\sqrt{5}$ into $3\sqrt{8}$.
3. Multiply $2\sqrt{3}$ intn $3\sqrt[3]{4}$.
4. Multiply $\sqrt{d}$ into $\sqrt[3]{ab}$.
5. Multiply $\sqrt{\frac{2ab}{3c}}$ into $\sqrt{\frac{9ad}{2b}}$.
6. Multiply $a(a-x)^{\frac{1}{2}}$ into $(c-d)\times(ax)^{\frac{1}{2}}$.
7. Multiply $5\sqrt{8}$ into $\sqrt{5}$.
8. Multiply $\frac{1}{2}\sqrt{6}$ Intn $\frac{1}{3}\sqrt{9}$.
9. Multiply $\frac{1}{4}\sqrt{18}$ into $5\sqrt{20}$.
10. Multiply $2\sqrt{3}$ into $13\frac{1}{4}\sqrt{5}$.
11. Multiply $72\frac{1}{2}a^{\frac{3}{4}}$ into $120\frac{1}{4}a^{\frac{1}{4}}$.
12. Multiply $4+2\sqrt{2}$ into $2-\sqrt{2}$.

One of our students has sent us the following creditable metrical version of

HORACE, Book 3, Ode 7.

Asteria, why bemoan the youth
Whom favouring winds and love of truth,
Laden with precious things will bring
Back to thy side in early spring?
Thy Gygea long by tempests tossed,
And cast on some deserted coast,
Full many a cold and sleepless night
Will pass before he greets thy sight.
Though his admiring hostess tries
To catch him with her young bright eyes,
Declares her love, around him plays,
And tempts him in a thousand ways;
Relates how simple Prœtus nigh,
Had raised the assassin's knife on high,
And stabbed Bellerophon the good
To please a women's spiteful mood,—
How Peleus feared the assassin's arms
For slighting Hypolita's charms,
And cites him history to prove
That faith is seldom kept in love;—
Her arts are vain. More deaf is he
Than rocks in the Icarian Sea;
Yet fears he lest Enipeus win
Thy heart ere he returns again.
What youth like Gyges e'er could guide
A ship on the Etruscan tide?
What youth like Gyges could restrain
A fiery courser on the plain?
Then close thy door at night betimes,
Nor heed the serenader's rhymes;
To Gyges ever constant prove,
And Gyges will requite thy love.—*J. T. F.*

THE RICH MAN'S SON AND THE POOR MAN'S SON.

BY J. R. LOWELL.

The rich man's son inherits lands,
And piles of brick, and stone, and gold,
And he inherits soft, white hands,
And tender flesh that fears the cold;
Nor dares to wear a garment old:
A heritage, it seems to me,
One would not care to hold in fee.

The rich man's son inherits cares;
The bank may break, the factory burn;
Some breath may burst his bubble shares
And soft, white hands would hardly earn
A living that would suit his turn:
A heritage, it seems to me,
One would not care to hold in fee.

What does the poor man's son inherit?
Stout muscles and a sinewy heart;
A hardy frame, a hardier spirit;
King of two hands; he does his part,
In every useful toil and art:
A heritage, it seems to me,
A king might wish to hold in fee.

What does the poor man's son inherit?—
Wishes enjoyed with humble things;
A rank adjudged by toil-worn merit;
Content that from employment springs;
A heart that in his labour sings;
A heritage, it seems to me,
A king might wish to hold in fee

What does the poor man's son inherit?—
A patience learned by being poor,
Courage, if sorrow come, to bear it,
A fellow feeling that is sure
To make the outcast bless his door:
A heritage, it seems to me,
A king might wish to hold in fee.

Oh! rich man's son, there is a toil
That with all others level stands:
Large charity doth never soil,
But only whitens, soft, white hands:
This is the best crop from the lands:
A heritage, it seems to me,
Worth being rich to hold in fee.

Oh! poor man's son, scorn not thy state;—
There is worse weariness than thine,
In merely being rich and great;
Work only makes the soul to shine,
And makes rest fragrant and benign:
A heritage, it seems to me,
Worth being poor to hold in fee.

Both heirs to some six feet of sod,
Are equal in the earth at last;
Both children of the same dear God;
Prove title to your heirship vast,
By record of a well-filled past:
A heritage, it seems to me,
Well worth a life to hold in fee.

Quand vous aurez donné à une femme le nom sacré d'épouse, vous devez vous consacrer à son bonheur, comme elle doit se consacrer au vôtre. Mais l'obligation qui pèse sur vous est d'autant plus grande que votre femme est une créature plus faible, et que vous lui devez, comme étant le plus fort, le bon exemple et toutes sortes de secours.—*Silvio Pellico.*

Le méchant fuit sans être poursuivi de personne; mais le juste est hardi comme un lion, et ne craint rien.—*Salomon*

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LESSONS IN GREEK.—No. XLVIII.

By John R. Beard, D.D.

Invariable Words.

The words which we have hitherto studied are susceptible of certain changes. With these changes I have endeavoured to make the student familiar. There are other words which do not undergo change, or undergo change only to a small extent. Many of these have occurred in the course of the instructions I have given. Nevertheless, invariable words must be put together, and spoken of specifically.

The Prepositions.

The prepositions require careful study, as on them, as well as on other invariable verbs, the sense very much depends, and you will be ignorant of some of the most delicate shades of meaning, and unaware of many an elegance, if you do not familiarise your mind with the import and the usage of the prepositions and the conjunctions particularly.

Prepositions have a relation to place, and denote the direction of an action in regard to place. Thus, I say "you go *from* home;" "you go *to* home;" "you go *round* the house;" "you go *over* the wall." In order, therefore, to your possessing an exact knowledge of the prepositions, of which there are in Greek eighteen, you must study them in their relation to place. In the ensuing table, they are arranged as they stand in regard to place.

The Prepositions arranged in their Relations to Place.

Relations to Place.	*Greek.*	*Latin.*	*English.*	*Examples.*
1. Place *where* you are	1. εν	in	in	εν τη πολει, *to be in the city.*
2. Place *whither* you go	2. εις or ες	in	into	εις την πολιν, *to go into the city.*
	3. προς	ad	to	προς την πολιν, *to go towards the city.*
3. Place *whence* you come	4. εκ or εξ	ex, e	out of	εκ της πολεως, *to go out of the city.*
	5. απο	ab, a	from	απο της πολεως, *to go from the city.*
4. Place *through* which you pass	6. δια	per	through	δια του πεδιον, *to go through (over) the plain.*
	7. ανα	per	up	ανα τα ορη, *to go up (over) the mountains.*
5. Place *at* which you stop	8. κατα	ad, de	down, at, on	κατα της ακτης, *to land on the shore.*
„ *down* which you go				
6. Different relations of position—				
Place by the side of	9. παρα	secundum, apud	along	παρα τον ποταμον, *to walk along the river.*
„ together with	10. μετα	inter, cum, post	with	μετα του πατρος, *to be with your father.*
„ connected with	11. συν and ξυν	cum	with	συν τω στρατω, *to follow the army.*
„ over	12. ὑπερ	super	over, above	ὑπερ των ἑπομενων, *to be above those who follow.*
„ under	13. ὑπο	sub	under, by	οἱ ὑπο τινι, *those who are under some one.*
„ before	14. προ	prae	before	προ των πυλων, *before the gates.*
„ on both sides	15. αμφι	circum	around	φαρος βαλειν αμφι τινα, *to throw a cloak around a person.*
„ around	16. περι	circum	around	τα περι τινος, *the things around a person, circumstances.*
„ on or upon	17. επι	in	on	ἐφ' ἱππων ειναι, *to be on horseback.*
7. Opposition, displacement	18. αντι	pro	against	αντι βασιλεως ... *to make one who was a king*
			instead of	δουλον ποιειν ... *a slave.*

In this general view it is only the general meanings that I have been able to give. It is the office of Syntax to set forth details, especially as the import of the prepositions is modified by the case which they govern, for, as you already know, most of them take more cases than one.

A little close attention will show you that the Latin prepositions are intimately connected with the Greek in origin as well as signification: thus, *εν* and *in* are the same; so are *εκ* and *ex*; so, also, *ὑπερ* and *super*, and *ὑπο* and *sub*.

The following six words may also be considered as prepositions, namely:—

ατερ, ανευ	*without*	ανευ της δικαιοσυνης, *without justice*
ἑνεκα	*on account of*	ἑνεκα τουτου, *on that account*
αχρι, μεχρι	*up to, until*	μεχρι Ῥωμης, *to (as far as), up to Rome*
πλην	*but, except*	πλην ἑνος, *one excepted.*

You have already seen how prepositions combine with verbs; I here present you a complete list of prepositions in combination, so that you may be able to have the whole at once under your eye, and study the matter thoroughly.

Prep.	*Prep. and Verb.*	*Signification.*
1. εν	εμβαλλω	*I cast into, I fall into.*
2. εις	εισαγω	*I lead to, into.*
3. προς	προσαγω	*I lead up to.*
4. εκ, εξ	εξαγω	*I lead out.*
5. απο	απαγω	*I lead from, away.*
6. δια	διασπειρω	*I disperse, scatter.*
	διατρεχω	*I run through, over, I traverse.*
7. ανα	αναβαινω	*I go up, mount, ascend.*
	αναλαμβανω	*I resume, take up.*
8. κατα	καταβαινω	*I go down, I descend.*
9. παρα	παραγω	*I lead beside, aside.*
	παραβαινω	*I go beyond, transgress.*
10. μετα	μεταμορφοω	*I change the form of, metamorphose.*
	μεταλαμβανω	*I take part with, partake.*
11. συν	συλλαμβανω	*I take with, I comprehend.*
12. ὑπερ	ὑπερβαινω	*I go over.*
13. ὑπο	ὑποβαλλω	*I put under, I subject.*
	ὑπογελαω	*I laugh a little, I smile.*
14. προ	προβαινω	*I go forward, I proceed.*
15. αμφι	αμφιβαινω	*I go round.*
16. περι	περιβαινω	*I surround.*
17. επι	επιβαλλω	*I throw on, I add.*
18. αντι	αντιβαινω	*I go against.*
	αντιδιδωμι	*I give instead, in exchange for.*

More than one preposition may combine with a verb; *e.g.*

εξαγω, I lead out (an army from its camp).
παρεξαγω, I lead out (an army against the enemy).
αντιπαρεξαγω, I lead out (an army and march it to assail the enemy).

Adverbs.

Among the invariable or indeclinable words are adverbs Adverbs qualify action in regard to

1. place
2. time
3. manner or quality
4. quantity
5. interrogation
6. affirmation
7. negation
8. doubt.

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1. *Adverbs of place.*

One kind of adverbs of place is derived from the prepositions. I shall arrange opposite to each other the eighteen prepositions and the adverbs to which they severally give birth.

	Prepositions.	*Adverbs.*	*Meaning.*
1.	εν	ενδεν, εντος	*within*
2.	εις	εσω	*within (with motion)*
3.	προς	προσω	*forwards, in advance*
4.	εξ	εκτος, εξω	*outwards, externally*
5.	απο	οπιθεν	*backwards*
6.	δια	διχα	*separately, apart*
7.	ανα	ανω	*above*
8.	κατα	κατω	*below*
9.	παρα and εξ	παρεξ, παρεκτος	*without, out of*
10. 11.	μετα and ξυν	μεταξυ	*between*
12.	ὑπερ	ὑπερθε	*above, aloft*
13.	ὑπο	ὑπαυθα	*before the eyes*
14.	προ	προὀρω	*in advance, moreover*
15.	αμφι	αμφις	*on both sides*
16.	περι	περιξ	*around*
17.	επι	οπισω	*behind, at the back*
18.	αντι	αντικρυ	*in face of*

These adverbs are often found before a genitive, and so perform the part of prepositions; *e. g.*

παρὀρω τῆς πολιως,
far from the city.
εισω τοῦ χαρακος,
within the entrenchments.

The following also may have a genitive; and others, which will be learned by practice, as

τηλε, *far off*	πελας, *near*
περα and περαν, *on the other side of (a river)*	εγγυς, *near*
χωρις, *separately*	αγχι, *near*

There is another kind of adverbs which, by means of certain terminations, express the different relations of place.

Place where you are.	*Place whither you go.*
ποῦ, ποθι, *where?*	ποῖ, ποσε, *whither?*
ἐκεῖ, ἐκεῖθι, *there*	ἐκεῖσε, *thither*
οἰκοι, οἰκοθι, *at home*	οἰκονδε, *home*
Ἀθηνησι, *at Athens*	ἀλλασε, *somewhere else*
	Ἀθηναζε, *to Athens*

Place whence you come.	*Place through which you pass.*
ποθεν, *whence?*	πῆ, *by what way*
ἐκεῖθεν, *thence*	ἐκειν, *by that way*
οἰκοθεν, *from home*	
ἀλλοθεν, *from some other place*	ἀλλη, *by some other way*
Ἀθηνηθεν, *from Athens*	

From this view you see that the terminations or particles

αυ, θι, οι, σι,	denote	*the place where you are*
δε, σε, ζε, and sometimes αι,	,, ,,	*whither you go*
θεν	,, ,,	*whence you come*
ῃ	,, ,,	*through which you pass*

Ου is the termination of the genitive; thus ποῦ represents επι ποῦ τοπου, *in what place?*

Οι is the old form of the dative, so that οικοι is for εν οικῳ.

Ἀθηνησι is for Ἀθηναις, the dative of Ἀθῆναι; this ending applies particularly to the names of cities.

Θεν appears to be an ancient form of the genitive; the poets say σεθεν for σοῦ, *of thee;* thus οικοθεν is equivalent to εξ οικου.

Θι is the termination of the dative, οδῳ being understood; thus αλλῃ is for εν αλλῃ οδῳ, *by another way.*

2. *Adverbs of Time.*

The principal adverbs of time are the following:—

σημερον,	to-day (from ἡμερα, a day)	Lat. *hodie*
αυριον,	to-morrow	*cras*
χθες,	yesterday	*heri*
προθες,	the day before yesterday	*nudius (nunc dies) tertius*
πρωι,	in the morning	*mane*
οψε,	in the evening	*vespere*
νῦν, νυνι,	now	*nunc*
παλαι,	of old, formerly	*olim, antea*
ουπω,	not yet	*nondum*
ηδη,	by this time	*jam*
ετι,	yet, still	*jam, amplius*
αρτι,	lately, but now	*modo*
αυτικα,	immediately	*mox, illico*
τοτε,	then	*tunc*
ποτε,	some time	*aliquando, tandem*
θαμα,	often	*sæpe*
αει,	always, successively	*semper, usque*
ουποτε,	never	*nunquam*
πριν,	previously, before	*prius*
ειτα,	next, then	*deinde*

3. *Adverbs of Quality.*

Adverbs of quality end in ως, and correspond to our adverbs in *ly.*

σοφῶς,	wisely	Lat. *sapienter*
πεπαιδευμενως,	learnedly	*docte*
ευδαιμονως,	fortunately	*feliciter*

To this class may be referred

οὑτως, before a consonant, οὑτω, thus, in this way, from οὑτος;
εκεινως, in that way, from εκεινος, that person.

And in general all the adverbs ending in ως.

Others have the form of the genitive or dative of the first declension.

εξῆς (from obsolete nominatives), *forthwith.*
εικῃ ,, ,, *by chance.*
ἡσυχῇ (from ἡσυχος), *peacefully.*

Usage has suppressed the iota subscript as found in ἡσυχῳ οὐδῳ. Other adverbs of quality have the terminations ει, τι, στι, and consequently resemble datives of the third declension:

πανδημει, *en masse, the whole people.*
αμαχητι, *without combat.*
ἑλληνιστι, *in the Greek language* or *manner.*

Some have the form of accusatives:—

ματην (nominative obsolete), *in vain.*
δωρεαν (nominative obsolete), *gratuitously.*

Those of this division in δον and δην, correspond with the Latin adverbs in *tim*:—

αγεληδον, *gregatim,* by flocks. κρυβδην, *furtim,* secretly.

Finally, some terminate in ις :—

μολις or μογις, *scarcely, with difficulty*;

and in ξ :—

οδαξ, *with the teeth.*
λαξ, *with the heel.*
πυξ και λαξ, *with all one's might.*

4. *Adverbs of Quantity.*

The adverbs of quantity are susceptible of the same terminations as those of manner. Here are some of them :—

αγαν, *too much.*
λιαν, *extremely.*
αδην, *abundantly.*
αλις, *sufficiently.*

Those which particularly mark number, end in ακις :—

ποσακις (from ποσος, *how many?*), *how often? how many times?*
πολλακις (from πολυς, *numerous*), *many times.*
τετρακις (from τετταρες, *four*), *four times.*
πεντακις (from πεντε, *five*), *five times.*

The rest of the adverbs formed from the cardinal numbers, follow this analogy; except :—

ἁπαξ, once, *semel* δἰς, twice, *bis*; τρις, three times, *ter.*

5 *Adverbs of Interrogation.*

ἠ asks a question simply, { *do you say this?* ἠ λεγεις τουτο ;
ἀρα asks a question mostly with an expressive *then*, { *do you, then, say this?* ἀρα λεγεις τουτο ;
μων (μη οὐν), expects a negation, *num*; μων λεγεις τουτο; *you do not say this, do you?*

It is also used in simple interrogations.

6. *Affirmation.*

ἠ, ἠ μην, *yes, certainly, in truth.*
ἄρα, in the poets, ρα, τοι, δη, } *then, certainly, assuredly.*
μεν denotes a contrast, and strengthens, = indeed, *quidem.*
γε asserts something in addition, and gives emphasis to its word, = *at least.*
ναι (Lat. *næ*, English, *nay*), *yes, truly.*

7. *Negation.*

ου (ουκ before a vowel), ουχι, Attic, ουδαμως, *by no means* } *no*, with direct negations and indicative mood.
μη, ου μη, μη ουχι, μηδαμως, *by no means* } *that not*, with indirect negations and imperative mood.

8. *Doubt.*

ισως, ταχα, που, without accent } *perhaps, probably.*
δηπου, δηθεν } *apparently.*

There are some words which, without being adverbs, are employed adverbially. We have seen adverbs which have the form of the genitives, datives, and accusatives. We are now to see those cases themselves perform the office of adverbs. Their cases are owing to certain prepositions which have been dropped in conversation :—

Gen. νυκτος (δια), *by night, at night.*
Dat. βια (συν), *by force, forcibly.*
κυκλῳ (εν), *in a circular, circularly.*
Acc. δικην (κατα), *in the form or manner of.*
χαριν (προς), *in favour of.*
πρωϊκα (κατα), *gratuitously.*

Sometimes the preposition is expressed and united to the noun, as :—

παραχρῆμα (παρα, *at*; χρῆμα, *the thing*), *at the moment.*
προυργου (προ, *for*; ἐργον, *the deed*), *usefully, beforehand.*
ἑκποδων (ἐκ, *from*; πους, *the foot*), *at a distance, far from.*

Adverbs formed from adjectives imply a substantive :—
Dat. ἰδιᾳ (ἐν ἰδιᾳ χωρᾳ), *in particular*; πεζῇ (ἐν πεζῇ ὁδῳ), *on foot.*
Acc. μακραν (εις μακραν ὁδον), *a long way, at a distance.*
The neuter of the adjective is often employed as an adverb; as the dat. πολλῳ, *much, by much*; ἡδυ, *agreeably*; δεινον and δεινα, *terribly*; ποτερα, *whether?* ἑπιτηδες, *on purpose.*

Conjunctions.

The following is a list of the chief conjunctions :—

Greek.	*Latin.*	*English.*
και, τε	*et, que*	and.
ἠ	*vel*	or.
ουτε, μητε	*neque, nec*	nor.
ουδε, μηδε	*et non*	
αλλα, δε	*sed, vero*	but.
μεντοι	*tamen*	however.
καιτοι	*atqui*	yet.
ἀρα	*ergo*	then.
ουν, τοινυν	*igitur*	therefore.
γαρ	*nam*	for.
ει, αν, εαν	*si*	if.
ειτε	*sive*	or, whether.
ει μη	*nisi, si non*	unless, if not.
ει και	*et si, etiam si*	and if.
καν	*et si*	and if.
ὁτι	*quod*	that.
ὡς, ὡστε	*ut*	so as, so that.
ἱνα	*ut*	in order that.
ἱνα μη	*ne, ut non*	in order that not, lest.
ἑπει	*quia*	because, since.
διοτι	*quia*	because, that.
γουν	*itaque*	therefore.
ἑπειδη	*cum* or *quum*	since.
ἑπειδαν	*postquam*	after that.
ὁτε, ὁταν	*quum*	when.
ἑως	*dum*	until.
ὁπως	*quomodo*	how?
ὡς, ὡσπερ	*sicut*	as, as if.

Of these conjunctions some are simple, as και, τε, ὡς; others are compound, as ουτε (ου and τε), μεντοι (μεν and τοι), καιτοι (και and τοι), τοινυν (τοι and νυν), ὡστε (ὡς and τε), διοτι (δια ὁτι, neuter of ὁστις), γουν (γε and οὐν), ἑπειδη (ἑπει and δη), ἑπειδαν (ἑπει, δε, and αν), ὁταν (ὁτε and αν); and others are two separate words, as ει μη, ἱνα μη.

There are other conjunctions, whether a single word, as ἡνικα, *when*, or several words united, as τοιγαροι (τοι, γαρ, τοι), *now then*; τοιγαρουν (τοι, γαρ, οὐν), *wherefore, on that account*; or, again, several words in a separate state, ου μην αλλα, *however*; πλην ει μη, *if only.*

One or two others deserve notice, as ἁτε, *seeing that, as being*, e.g. ἁτε αγαθος, *as being good* (Latin, *utpote bonus*); περ, *although*, e.g. αγαθος περ, *although good.*

There are certain words employed as adverbs, in the composition of which there is a conjunction, e.g. δηλονοτι, *evidently*; that is, δηλον εστιν ὁτι, *it is evident that*; ενιοτε, *sometimes*, made up of ενι, for εστιν, and ὁτε (in Latin, *est quando*).

The Greek is rich in conjunctions. Some of its conjunctions express shades of meaning which can scarcely, if at all, be

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rendered into English, and which can be appreciated only in the original, by the fine sense of a superior scholar.

Interjections.

Interjections, as expressing almost inarticulately the passions and emotions of the mind, are also numerous in the language of the Greeks, who were a people of strong feelings. The principal interjections are these :—

ὦ, *O!* (sign of the vocative) ὤ, *O!* expressing pain or surprise.)
οἰοῖ, *ah! alas!*
εὐοῖ, *eheu! ho!*
φεῦ, *ah!*
βαβαί, *ah! oh!* (Latin, *papæ!*)
οὐαί, *woe!*
ἀ, *ah!*
αἰ, οἰ, ὤ } *alas!* (Latin, *hei!*)
εἶα, *come!* (Latin, *eia!*)
εὖγε, *well done!* (Latin, *euge!*)

Some imperatives are used as interjections :—

ἄγε, φέρε, ἴθι } *come!* (Latin, *age!*)
ἄπαγε, *begone!* (Latin, *apage!*)

Historical Anecdotes.

Ἀγησίλαος πέρι ἀνδρείας καὶ δικαιοσύνης ἐρωτηθείς, ποτέρα βελτίων, Οὐδὲν ἀνδρείας, ἔφη. χρῄζομεν, ἂν πάντες ὦμεν δίκαιοι. Οὐ μόνον δὲ τὸ μὴ ἀποδίδοναι χαρίτας αἴσχιον εἶρηνεν, ἀλλὰ καὶ τὸ μὴ πολὺ μείζους τὸν μείζω δυναμένων. Διὰ τὸ φιλόπονος εἶναι, πᾶν μὲν τὸ παρὸν ἡδέως ἔπινε, πᾶν δὲ τὸ συντυχὸν ἡδέως ἤθειν· εἰς δὲ τὸ ἀσμένως κοιμηθῆναι πᾶς τόπος ἦν ἱκανὸς αὐτῷ. Δίδοντος δέ αὐτῷ πάμπολλα δῶρα Τιθραύστου, εἰ ἀπέλθοι ἐκ τῆς χώρας, ἀπείρηνατο ὁ Ἀγησίλαος, Ω Τιθραῦστα, νομίζεται παρ' ἡμῖν τῷ ἀρχοντι καλλίον εἶναι τὴν στρατιὰν ἢ ἑαυτὸν πλουτίζειν, καὶ πάρα τῶν πολιτῶν λαφύρα μᾶλλον πειρᾶσθαι ἢ δῶρα λαμβάνειν. Ἀποθνησκων δὲ τοὺς φίλους ἐκέλευσε, Μηδεμίαν εἰκόνα ποιησασθαι· εἰ γάρ τι καλὸν ἔργον πεποιήκα, τοῦτο μοι μνημεῖον ἐστιν· εἰ δὲ μηδέν, οὐδ' οἱ πάντες ἀνδριάντες.

Vocabulary and Remarks.

Τὸ μὴ πολὺ μείζους, supply *ἀποδίδοται*
συντυχόν, whatever he met with;
κοιμηθῆναι (from *κοιμάω, I lie, I sleep*), *every place sufficed to afford him a pleasant couch* (*or bed*).
Δίδοντος, *offering to give;* λαφῦρον, *ου, τό, booty, spoil.*
Ἀνδριάντες, *all images would not* (*no image would*) *be a* (*permanent*) *memorial of me.*

What are these parts (what is their mood, tense, person, etc.)? namely :—

ἐρωτηθείς; χρῄζομεν; ἀποδίδοναι; εἶρηνεν; ἤθειν; κοιμηθῆναι; ἀπέλθοι; ἀπείρηνατο; πειρᾶσθαι; πεποιήκα.

Decline the following :—ἀνδρείας; χαρίτας; μείζους; τόπος; δῶρα; εἰκόνα; μνημεῖον; ἀνδριάντες.

p. 32

CHRONOLOGY.—No. III.

B.C.
481—Xerxes the Great, king of Persia, began his expedition against the Greeks.
479—Battle of Platæa, and defeat of the Persians.
477—Fortification of the Piræus by the Athenians.
471—Ostracism of Themistocles.
460—Pericles takes the lead in Athenian affairs.
458—Return of the Jews from captivity.
454—Pericles placed at the head of the Athenian forces.
451—The Romans compile the laws of the Twelve Tables.
443—Volscians compelled by the Romans to pass under the yoke.
435—Pindar, the Greek poet, flourished.
432—Phidias, the sculptor, flourished.
432—The Peloponnesian war begins.
B.C.
429—Death of Pericles.
413—Herodotus, the historian, flourished.
409—Alcibiades takes Byzantium.
407—Sophocles and Euripides, Greek poets, flourished, as did Confucius, the Chinese philosopher.
400—The city of Delhi, in India, founded.
Socrates, founder of moral philosophy in Greece, died.
382—Demosthenes, the orator, born.
364—Battle of Olympia.
362—Earthquake at Rome; when, according to the legend, Marcus Curtius leaps into the gulf, and so saves the city.
359—Accession of Philip, king of Macedon.
356—Alexander the Great born.
331—Alexander, king of Macedon, conquers Darius, king of Persia.
327—Alexander's expedition against India; he defeats Porus, and marches through the Punjaub.
323—Alexander dies at Babylon.
322—Death of Demosthenes and Aristotle.
304—Siege of Rhodes by Demetrius.
300—Building of the Great Wall of China.
291—Invasion of Thessaly.
284—The Old Testament translated into Greek by seventy-two interpreters, and called the Septuagint.
283—Alexandrian Pharos erected.
279—Invasion of Greece by the Gauls under Brennus.
264—The First Punic War begins, and continues twenty-three years.
255—Regulus defeated and taken prisoner by Xantippus.
250—The Carthaginians defeated by the Romans in a naval engagement.
241—Termination of the First Punic War—Rome victorious.
237—Hannibal, the Carthaginian, at nine years old, swears eternal enmity to the Romans.
235—The Temple of Janus shut, in token of Rome being at peace with all the world
218—The Second Punic War begins, and continues seventeen years. Hannibal crosses the Alps and defeats the Romans.
204—Defeat of Hannibal by Sempronius.
182—Death of Hannibal.
168—Perseus defeated by the Romans. End of the Macedonian Empire.
165—The government of the Jews under the Maccabees begins, and continues 126 years.
149—Commencement of the Third Punic War.
146—Carthage destroyed by the Romans
107—Death of Cicero.
86—Death of Marius.
63—Jerusalem taken by Pompey.
52—Julius Cæsar invades Britain.
47—The Battle of Pharsalia.
Death of Pompey.
Alexandrian library burnt.
45—Reform of the Roman Calendar. Julian Period introduced.
44—Julius Cæsar killed in the Senate House.
Battle of Actium fought, in which Mark Anthony and Cleopatra were totally defeated.
38—Capture of Jerusalem by Herod, son of Antipater, Roman governor of Judea.
30—Alexandria taken by the Romans; Anthony and Cleopatra kill themselves.
Octavius, nephew to Julius Cæsar, by a decree of the Roman Senate, takes the title of Augustus Cæsar.

ANSWERS TO CORRESPONDENTS.

B. R.—The waters of the ocean and of seas is always and everywhere salt. The only exception, and this is easily accounted for, is at the mouths of large rivers, where the quantity of fresh water displaces that which properly belongs to the sea.

John L. (Stockport).—Surgical operations on the eyes have been very successfully performed, so as entirely to remove a natural obliquity of vision. But the operation is of so delicate a nature that it should be entrusted to none but skilled hands.

L. M.—The combination *gh* at the beginning of a word drops the *h*, as in ghost, ghostly, gherkin. Pronounce "ghost" as rhyming with "most." But when these letters come at the end of a word, they form some of the grossest anomalies in our language. *Gh* at the end of words is generally silent, and consequently the preceding vowel or diphthong is long, as high, nigh, thigh, bough, dough, though, plough, furlough, slough, through, borough, usquebaugh, pugh. Sometimes *gh* sounds like *f*, as in laughter, laugh, &c.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LV.

(*Continued from page* 21.)

MAGNETISM.

THE PROPERTIES OF THE MAGNET.

Natural and Artificial Magnets.—The name of magnet is given to substances which possess the quality of attracting iron and some other metals, such as nickel, cobalt and chromium. We shall, however, give an account of experiments which prove that magnets act really upon all substances, sometimes by attraction, sometimes by repulsion, but with very slight effect.

There is a marked distinction between natural magnets and artificial magnets. The real magnet, or loadstone, is an oxide of iron, known in chemistry as the magnetic oxide. The magnetic oxide is very abundant. It is found in primitive formations, especially in Norway and Sweden, where it is worked as ironstone, and yields the best iron in the world.

Artificial magnets are bars or needles of tempered steel, without any natural magnetic qualities, but capable of acquiring them by friction with a magnet, or by means of electric processes to be hereafter described. Artificial magnets are also made of soft or malleable iron, that is, iron without any perceptible amount of foreign matter in its composition. Their magnetic power is not, however, so durable as that of steel rods. Artificial magnets have more power than real ones, and possess at the same time exactly similar qualities.

The attractive power of magnets exists irrespectively of distance and the interposition of solid or other masses; but it decreases as the distance increases, and varies with the temperature. It has been shown that the magnetic force of a rod diminishes as its temperature is increased, but recovers its original intensity when it regains its primitive temperature, provided a certain limit is not passed; for at red heat magnets entirely lose their power.

The attractive power exercised by the magnet over iron is reciprocal, a fact true as a general principle of all attractions. This may be verified by holding a bar of iron towards a magnet, when the latter will be attracted.

The attractive influence of the magnet is known as *Magnetic Power* or intensity, and the theory in natural philosophy is called magnetism, an expression which must not be confounded with *Animal Magnetism*, which is employed to signify the power possessed by one person over another by the force of his will—a power far from being proved to exist.

Poles and Neutral Lines.—Magnets do not possess the same magnetic force in every part. If you roll a magnetic bar in iron filings, these will be found to adhere to the ends of the bar, in the shape of tufts of hair standing on end, fig. 361.

Fig. 361.

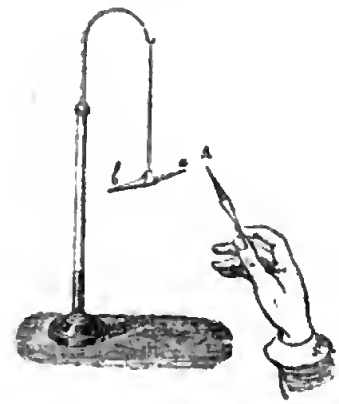


The adherence of the filings rapidly decreases from the extremities till it disappears altogether in the middle of the bar. That part of the surface of the magnet where the attractive power is imperceptible, is called the neutral line or point, and the two points at the extremities where the power is greatest are called the poles. Every magnet, real or artificial, has two poles and a neutral line. In the magnetising, however, of rods and needles, opposite poles are sometimes produced alternately situated between the extreme poles. These intermediate poles have been called consequent points. But usually there are only two poles, and we shall only speak of two.

The one pole is called the South or Antarctic pole; the other the North or Arctic pole; expressions which owe their origin to the influence of the terrestrial poles on the magnet. In our diagrams, the south pole is represented by *a* and A, the north pole by *b* or B, and we denominate those represented by the same letter, poles of the same name.

Mutual Action of the Poles.—The two poles of a magnet appear identical when acting on iron filings, but this identity is only apparent. If we hang a little magnetised needle *a b*, fig. 362, by a fine thread, and bring the south pole A of another

Fig. 362.



needle near the south pole *a* of the first, we shall at once see a marked repulsion; while if we present the pole A to the north pole *b* of the movable needle, there will be a powerful attraction. The poles *a* and *b* then are not identical, as the one is repelled and the other attracted by the same pole A of the magnet which we hold in our hand. We can in the same way verify the fact that the two poles of the latter magnet also differ one from the other, by presenting them in turn to the pole *a* of the moveable needle. In the one case the needle is repelled, in the other it is attracted. We may then at once lay down the simple axiom with regard to the reciprocal influence of two magnets:—

"The poles of the same name repel one another, and the poles of an opposite name attract."

That is, *a* repels A and attracts *b*; *b* repels B and attracts *a*.

The contrary action of the north and south pole may also be demonstrated by the following experiment. Place a piece of iron, a key for instance, close to a magnetic bar; then over this bar slide a second of the same power, fig. 363, taking care

Fig. 363.



to reverse the poles. The key will stick fast as long as the two poles are apart, but as soon as they are sufficiently near, it falls, as if the bar that supported it had suddenly lost all magnetic power; but this will be seen not to be the case, as soon as the second bar is removed.

Theory of two Magnetic Fluids.—To explain the phenomena to which we have already alluded, natural philosophers have been induced to adopt the theory of two magnetic fluids, each fluid acting by repulsion on itself, and by attraction on the other fluid. One of these fluids is called the southern fluid, and the other the northern fluid, from the names of the poles of the magnets upon which their influence is predominant.

It is supposed that before the state of magnetism, these fluids are combined around each particle and neutralise each

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other; but that they may be separated under the influence of a power greater than their mutual attraction, and may alter their position around the particles without going out of the sphere of action assigned to them in the neighbourhood of the particles. The fluids are then set with regard to the cardinal points; that is to say, in the magnetic sphere which surrounds each particle, the northern fluid flows constantly in one direction, and the southern fluid in an opposite one; whence arise two resultant forces acting in contrary directions, the points of application of which are the two poles of the magnet. As soon, however, as the setting of the fluid ceases, equilibrium is again established around each particle, and the final result is null, that is to say, there is neither attraction nor repulsion.

The theory of two magnetic fluids readily explains many phenomena, and is therefore generally adopted as a means of demonstration. It will be seen, however, hereafter, that in all probability magnetic phenomena result, not from the opposite actions of two particular fluids, but from particular currents of electric matter in magnetised bodies—an hypothesis which has the advantage of connecting the theories of magnetism and electricity together.

Difference between Magnetic Substances and Magnets.—Magnetic substances or bodies, are those which are drawn or attracted by the magnet, such as iron, steel, nickel. These bodies all contain the two fluids, but in a neutralised state. Ferruginous compounds are generally magnetic, and are the more so, the more iron they contain. Some, however—as persulphuret of iron for instance—are not attracted by the magnet.

It is easy to distinguish a magnetic substance from a magnet; the former has no poles. On being presented successively to the two extremities of a moveable needle *a b*, fig. 362, it attracts both, while a magnet would attract one and repel the other, if the same end of the same magnet were presented to them.

Magnetisation by Induction or Contact.—When a magnetic substance is put in contact with a magnetic bar, the two fluids of this substance are separated, and it becomes, as long as the contact lasts, a complete magnet, with its two poles and neutral line. For example, if you apply to one of the poles of the magnet, fig. 364, a small cylinder *a b* of soft iron, this cylinder

Fig. 364.



will in its turn bear a second, then a third, and so on to seven or eight, according to the force of the bar. Each of these little cylinders is a magnet, but only while the influence of the magnetised bar lasts. If the contact between the magnet and the first piece of iron be broken, immediately, or at all events after a very brief interval, the other cylinders are detached and retain no trace of magnetic force. The separation of the two fluids has therefore only been temporary. Nickel is also easily magnetised under the influence of a powerful magnet.

Magnetisation by contact explains the formation of the tufts of iron filings which cling to the poles of the magnet, fig. 361. The particles in contact with the magnet act upon the next ones, these again upon the following, and so on, which gives rise to the thread-like arrangement of the iron filings around each pole.

Coercive Power.—We call that coercive power, which in a magnetic substance more or less opposes the separation of the two fluids, and their subsequent recomposition when they have been separated. From the above experiment, it will be seen that this power is imperceptible in soft iron, this metal being instantly magnetised by contact with a magnet. In tempered steel, on the other hand, this power is great, and greater in proportion to the temper of the steel. In fact, when put in contact with a magnet, a bar of steel becomes magnetic only by slow degrees. It is even necessary to rub it with one of the poles of the magnet, if we wish to give the whole force of the loadstone. The separation of the two fluids presents a resistance which is not found in malleable iron. It is the same with their recomposition; for a bar of steel, once magnetised, is a very long time before it loses its magnetic power. By oxidation, pressure, or twisting, soft iron may acquire a certain coercive force, but of short duration.

Experiments with Broken Magnets.—The presence of the two fluids in every magnet is demonstrated by the following experiment. Take a steel knitting-needle, which is magnetised by rubbing it over with one of the poles of a magnet. Then having thus proved the existence of the two poles and the neutral line by means of the iron filing experiment, break the needle in the middle, that is to say, at about the neutral line. Now, if you bring the two halves successively in contact with the poles of a moveable needle fig. 362, you will find that instead of each containing only one fluid, each separate part has its two poles and its neutral line. If you again break these two magnets into two other parts, you will again find that each of these again is a complete magnet, with its two poles and neutral line, and so on as long as you can break the steel into lengths. We conclude, therefore, from analogy, that the very smallest parts of a magnet contain both fluids.

Action of Magnets on all Substances — Diamagnetism.—Coulomb, in 1802, observed that magnets act upon all substances in a greater or less degree; a phenomenon which he demonstrated by causing little bars of various substances to oscillate first between the opposite poles of two strongly magnetised bars, and then away from the influence of any magnet, and comparing the number of oscillations in the two cases in equal times. At first the result of these experiments was ascribed to the presence of ferruginous matters in the substances upon which the experiments were made; but M. Lehaillif, and at a later period Messrs. Becquerel, demonstrated that magnets have really an influence upon all substances. It has been proved that this influence is sometimes attractive, sometimes repulsive. The substances which are attracted are called magnetic bodies, while those which are repelled have been denominated diamagnetic substances. Among these may be mentioned bismuth, lead, sulphur, wax, water, etc. Copper is sometimes magnetic, sometimes diamagnetic, which probably depends on the degree of its purity.

Mr. Faraday, in 1847, noticed that powerful magnets had a strong repelling influence upon flames, which he attributed to a different degree of diamagnetism in gases. M. Edw. Becquerel subsequently made some important experiments on this subject, and found that, of all gases, oxygen has the greatest magnetic power.

Some natural philosophers have described the diamagnetism as a property distinct from magnetism. M. Edw. Becquerel has connected the phenomena of magnetism and diamagnetism by an ingenious hypothesis. He considers that there are not two distinct kinds of action between bodies and magnets; but only one kind of magnetic induction, and that the repulsion exerted upon certain bodies is to be accounted for by the fact that these bodies are surrounded by a medium more magnetic than themselves.

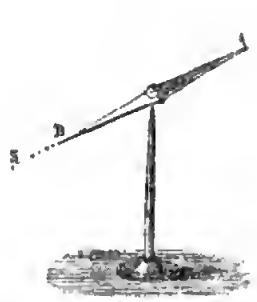
TERRESTRIAL MAGNETISM—THE COMPASS.

The Directing Influence of the Earth on Magnets.—When we hang a magnetic needle by a thread, as in fig. 362, or when we place it on a pivot upon which it can easily turn (fig. 365), we observe that the needle, instead of settling down in any chance position, always ends by becoming stationary in a position which is more or less that of north and south. The same thing occurs if in a vase full of water we place a cork float, and on this lay a little magnetised rod. The cork oscillates at first, and when it stops, the straight line which joins the two poles of the magnet is still about in the direction of the north and south. It must, however, be noted that in this experiment neither the cork nor the bar moves to the north or south. The action of the terrestrial poles on the magnet is not attractive, but merely a guiding influence.

Similar experiments having been made in all parts of the world, the earth has been assimilated to an immense magnet, the poles of which are near the terrestrial poles, and the

neutral line of which coincides very nearly with the equator. It is from this hypothesis that the name of the northern fluid has been given to that which predominates at the northern pole of the earth, and of southern fluid to that which predominates at the opposite pole. According to this supposition, the earth acts on the needles in the same way that a magnet does, the poles of the same name repel, those of the opposite name

Fig. 365.



attract. Consequently, when a magnetised needle settles in the direction of north and south, the pole which points to the north contains the southern fluid, while that which points to the south contains the northern fluid. For this reason, the pole which points to the north is called the south pole, that which points to the south the north pole.

Magnetic Meridian—Declination.—It is well known that the astronomical meridian of a place is the plane which passes through the place and through the two terrestrial poles, and that the meridian is the intersection of the plane with the surface of the globe. In the same way the magnetic meridian of a place is the plane, which at that place passes through the centre of the earth, and through the two poles of a magnetised needle in equilibrium on a vertical axis.

This being premised, as the magnetic meridian does not in general coincide with the astronomical meridian, the *declination of the magnetised needle*, in any place, is the angle made at that place by the magnetic meridian with the astronomical meridian, or, which comes to the same thing, the angle formed by the direction of the needle with the meridian. The declination of the needle to either eastern or western, according as the south pole of the needle is to the east or the west of the astronomical meridian. It is also called the variation of the compass.

Variations of the Declination.—The declination of the magnetic needle, which varies very much in different places, is western in Europe and Africa, eastern in Asia and America. It moreover has many variations even in the same place: some, which may be regarded as regular, are secular, annual, or diurnal; others which are irregular, are called perturbations.

Secular Variations.—At the same place, the declination varies at different times, but sometimes continues on the same side of the astronomical meridian, that is to say, to the east or west, for several centuries.

The declination for Paris has been noted since 1580. The following are the variations which have taken place:

1580	11° 30′ to the East.	1816	22° 25′ to the West
1665	0	1825	22 22
1700	8 10 to the West.	1830	22 12
1780	19 55	1835	21 [illegible]
1785	22 00	1850	20 30
1814	22 34	1851	20 25

This table demonstrates that since 1580 the declination has varied in Paris more than 34°, and that the maximum of the western deviation took place in 1814. Since that time the needle has been returning to the east.

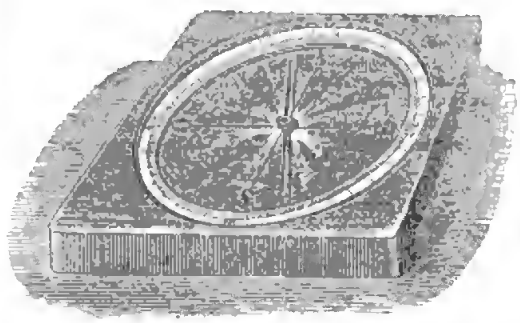
Annual Variations.—The annual variations were indicated by Cassini, who observed in 1784, that from the vernal equinox to the summer solstice, the needle in Paris retrograded towards the east, and that on the other hand it advanced towards the west during the other nine months. The maximum of amplitude observed during the same year was 20′. However, the annual variations are very little known, and appear to be irregular.

Diurnal Variations.—Besides the secular and annual variations, the declination undergoes diurnal variations, which are very slight, and only to be observed by the use of very long needles and exceedingly delicate instruments. In the climates of the north-west of Europe, the north pole of the needle advances every day from east to west, from the rising of the sun until about one o'clock p. m. It then makes a retrograde movement to the east, so as to arrive about ten o'clock at night very nearly at the point of departure in the morning. During the night the needle varies very little, but still does tend slightly towards the west.

Accidental Variations or Perturbations.—The declination of the magnetised needle is accidentally affected in its diurnal variations by many causes, such as the aurora borealis, volcanic eruptions, and thunder. The effect of the aurora borealis is felt at an enormous distance. Though only visible in the north of Europe, it sometimes acts upon the needle in these latitudes, so as to produce a variation of 20′. In the polar regions the needle oscillates sometimes to the extent of several degrees. Its irregular motion during the whole day which precedes the aurora borealis, announces the phenomena beforehand.

Declination Compass.—The declination compass is an instrument which is used to measure the magnetic declination of a place, when the astronomical meridian is known. It consists of a graduated horizontal circle, fig. 366, in the centre of which

Fig. 366.



is a very slight magnetised needle. This needle, which has the form of an elongated lozenge, is fixed at its centre to an agate cap, resting on a vertical steel pivot. By this means the friction is very slight, agate being a very hard stone.

To observe the declination at any place by means of this instrument, it is so placed that the diameter N S is in the astronomical meridian of the place, the extremity N pointing to the north. Then by reading on the graduated limb, the angle formed by the needle with the diameter N S, to the right or left of zero, we have the measure of the western or eastern declination. In the accompanying engraving the needle marks an eastern declination of 21°.

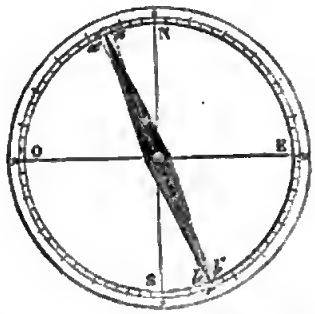
On the other hand, to find the astronomical meridian, when we know the declination, we turn the compass so that the needle may make with the diameter N S an angle equal to the angle of declination and in the same direction. The diameter N S prolonged gives the direction of the astronomical meridian. This method, however, is only approximative, because of the continual variation of the declination.

Turning the Needle.—The applications of the declination compass which we have just indicated are only exact in proportion as the magnetic axis of the needle, that is to say, the right line which passes through the two poles, coincides with the axis of the needle itself, that is to say, with the right line which connects its two extremities. In general this condition is not fulfilled. This source of error is corrected by turning the needle. For this purpose, the needle is not fixed to the cap, but is simply rested on it, that it may be removed and turned round, and then placed again on the cap, so that the lower face becomes the upper face, and *vice versa*. Taking then the medium between the declination now marked by the needle, and that which it gave before, we have the exact declination.

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In fact, if the right line $c s$ represents the axis of the needle, and the right line $a b$ its magnetic axis (fig. 367), the true declination is not denoted by the arc $c N$, which is too great, but by the arc $a N$. Now if we turn the needle, the magnetic

Fig. 367.



axis $a b$ does not take the position $a' b'$, but comes back exactly to its first direction, while the extremity e passing between the points a and N, describes an arc precisely as much too small as the first arc was too large. The medium between the two arcs observed gives the true declination.

Mariner's Compass.—The directing action of the earth on the magnetised needle has been put to a very important use in the mariner's compass, known also as the variation compass, or sea compass. It is a declination compass used to guide the progress of ships on the sea. Fig. 368 represents it enclosed, in a rectangular box, which is again placed in another large box called the binnacle, fixed to the after-deck of the ship. Fig. 369 is a transverse section. In these two cuts the same letters indicate the same parts of the instrument.

The needle $a b$ (fig. 369), which is easily moveable on a pivot, is fixed to the lower surface of a sheet of talc, on which is drawn a star or mariner's card with thirty-two branches, indicating the eight points of the wind, the half and quarter points. In order that the compass may always preserve its horizontal position, in spite of the rolling and pitching of the ship, it is supported by two concentric moveable rings, one round the axis $s s$, the other round the axis $s d$, perpendicular to the first, fig. 368.

An opening M, covered with a plate of rough glass, is used to light the compass during the night. For this purpose a lamp placed outside the box, facing the glass pane, throws its light into the inside. The bottom n of the cylindrical box O, in which is the needle, is a pane of polished glass, that gives passage to the light to illuminate the sheet of talc t, which bears the mariner's card upon it, and which is transparent. A second pane of glass m covers the compass, and a pivot i, fixed in the centre of the pane, serves to fix a graduated dial-plate A, which is only used for taking the bearings of coasts.

To guide a ship by means of the compass, the navigator first finds on a naval chart what is the point of the wind the vessel must steer by to reach its destination. Then with his eye fixed on the compass, the helmsman turns the tiller of the rudder until the point fixed on and marked on the card, coincides with an imaginary line passing through the two points s and d, marked on the edge of the box, fig. 368, and which is parallel with the keel of the vessel. The variation, however, of the declination in different parts of the globe, compels navigators continually to correct the observations they make with the compass.

The inventor of the mariner's compass is not known, nor the precise date of its invention. Guyot de Provins, a French poet of the twelfth century, is the first author who speaks of the use of the magnet in navigation. The ancients, who had no knowledge of the compass, enjoyed no better guide than the sun or the polar star. They were obliged, therefore, to sail in sight of land, or to run the risk of losing their way when the sky was cloudy.

Fig. 368.

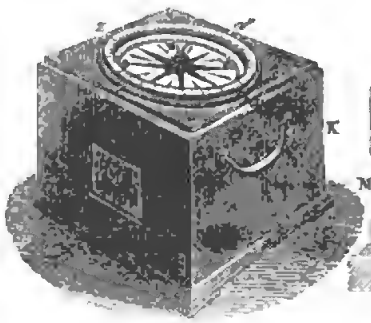
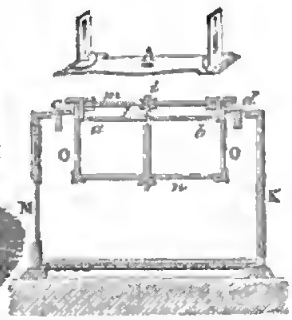


Fig. 369.



LESSONS IN MORAL SCIENCE.—No. III.

WHETHER WE ALWAYS DO RIGHT BY OBEYING THE DICTATES OF CONSCIENCE?

This is one of the most perlexing questions in the science of morals. Many are of opinion that all that is necessary to render an action good is that the agent act agreeably to the dictates of his own conscience. This may be considered a vulgar opinion, usually taken up without much consideration. But there is an opinion, near akin to this, which has been advocated by some of the greatest men of the age; namely, that men are not responsible for their opinions or belief. It is thought that the adoption of this as a maxim is the only effectual method of putting an end to the bitter animosities and controversies among the advocates of different creeds.

It is not wonderful that they who make moral sense, in a sort, infallible, and the ultimate standard of right and wrong, should hold that men cannot go astray if they will honestly listen to the voice of conscience, and obey her dictates!

But as we have shown that conscience is the judgment of the mind respecting duty, and as no man's knowledge is perfect or infallible, it follows, therefore, that so far as there is error in the understanding in relation to matters of duty, just so far the conscience will be misguided. The question at issue, therefore, is whether an action, wrong in itself, can be considered as a good and virtuous action if the agent believes that it is right. If the affirmative were true, then the discovery of truth would be of no value, for obviously upon this principle error is just as good as truth. But as soon would we believe that darkness is as good as light to direct us in the way which we wish travel. Again, this theory supposes that a man is under no law but his own opinion, or the dictates of conscience; that, therefore, which is a sin in one man may be

duty to another in precisely the same external circumstances and relations; which would be to confound all moral distinctions. This theory would go to sanction every form of religion, however corrupt and superstitious; and to make the vilest immoralities virtuous; for there can be no doubt that the votaries of idolatry, in their most cruel and abominable rites, follow the dictates of an erring conscience. When the heathen sacrifice to demons, and when the victim is a human being, or even a first-born son, there is nothing wrong, for all these acts of worship are performed in obedience to conscience. Every species of persecution and the Inquisition itself may be justified on this principle. Instead, therefore, of putting an end to all animosity, it would bring back, in all their horrors, the days of persecution for conscience' sake.

On this subject, again, our appeal must be to the unbiassed judgment of mankind; and we think the verdict will be, that error which might have been avoided, and ignorance, which is not invincible, do not excuse. The knowledge necessary to duty is within the reach of every man, were he disposed sincerely to seek after it. But it is a truth which is of importance on this subject, that one false step leads to another; and though a man who has adopted fundamental error, labours under a kind of necessity to do wrong, yet this does not excuse him, because he ought to have exercised more diligence and impartiality in seeking for the truth, and is justly liable to all the evil consequences resulting from this neglect.

Suppose a man to have been educated in a wrong system of religion and morals; he is responsible, because, when arrived at the years of maturity, he should have brought the opinions received by education under an honest examination. The more difficult it is divest ourselves of prejudices thus imbibed, as it were, with the mother's milk, the more necessary is it that, under the influence of a sincere love of truth, we should, with impartiality, diligence, and resolution, endeavour to do so. It is no proof that such a course is not the solemn duty of man, that few ever perform it. The prevalence of error in the world, is very much owing to the neglect of this duty. This neglect arises from culpable indolence, from a desire to remain in agreement with the multitude or with our parents and teachers, from aversion to the truth and an unwillingness to deny ourselves, and incur the inconvenience and persecution which an avowal of the truth would bring upon us. But none of these reasons will justify us in adhering to opinions which are detrimental to ourselves and others, or contrary to our moral obligations. It is true, if a man's conscience dictates a certain action, he is morally bound to obey; but if that action is in itself wrong, he commits sin in performing it, nevertheless. He who is under fundamental error, is in a sad dilemma. Do what he will, he sins. If he disobey conscience, he knowingly sins, doing what he believes to be wrong; and a man never can be justified for doing what he believes to be wrong, even though it should turn out to be right. And if he obey conscience, performing an act which is in itself wrong, he sins; because he complies not with the law under which he is placed. It may be asked, "How can a man be responsible in such circumstances, when he is under a necessity of doing wrong?" We are responsible for suffering ourselves to be brought into such a state; we are responsible for our ignorance of the truth. Hence we see how important the duty of seeking after truth with untiring diligence, and honest impartiality. The same necessity is found to arise from forming bad habits, and cherishing evil passions. The heart in which envy to another has been indulged until it has become habitual, cannot exercise kind and brotherly affections to that person; but this is no excuse. The fault may be traced far back, but guilt is attached to every act of envy, however inveterate the habit. If this were not so, the greater the sinner, the less his responsibility.

The objection to making a man responsible for his opinions, is, that his belief does not depend upon his will, but results necessarily from the evidence existing before the mind, at any moment. This is true; but we may turn our minds away from the evidence which would have produced a conviction of the truth. And this is not all; there may be such a state of mind, that evidence of a certain kind cannot be perceived. Depravity produces blindness of mind, in regard to the beauty and excellency of moral objects. But every man ought to be free from such a state or temper of mind as produces distorted or erroneous views. Surely, moral depravity cannot be an excuse for erroneous opinions. All actions proceed from certain principles; if, therefore, the action is wrong, because of the corrupt principle, the burden of culpability must be rolled back upon the principle, or state of the soul, which sends forth evil acts, as a poisoned fountain sends forth deleterious streams.

Metaphysical reasoning, however, rather perplexes and obscures than elucidates such points. Let us hold fast by the plain principles of common sense, and appeal to the common judgment of mankind; and the decision will be, that ignorance or error which might have been avoided, never excuses from blame. The same is true of all evil habits and inveterate passions, which have been voluntarily or heedlessly contracted. The whole course of a moral agent must be taken together; his moral acts are complicated, and intimately connected. They form a web, in which one thread is connected with another, and one serves to give strength to another. If we honestly consult our conscience, we feel guilty when we have done wrong, even though we did it ignorantly; because we ought not to have been in ignorance.

Two things, therefore, are necessary, in order to determine that an action is right: first, that the state of mind of the agent be such as it ought to be; and secondly, that the action be in conformity with the law under which we are placed; for the very idea of morality supposes us to be under a moral law.

While, then, we cannot do better than obey conscience; yet if conscience is erroneous, we do not fulfil our duty by such obedience, but may commit grievous sin. For following the dictates of conscience, is only one circumstance essential to a good action. When we do wrong while obeying the dictates of conscience, the error does not consist in that obedience, but in not following the right rule, with which rule the accountable moral agent should be acquainted.

WHETHER THERE IS IN THE MIND A LAW OR RULE, BY WHICH MAN JUDGES OF THE MORALITY OF PARTICULAR ACTIONS?

If such a rule existed in the mind prior to the observation of particular acts of a moral nature, we should be conscious of it: nothing of the nature of a law or rule can have existence in the mind, without the knowledge of the mind itself.

There seems to be a common mistake as to the process of the mind in regard to general principles. It seems to be thought that in order to judge whether an action be right or wrong, there must be something like a general rule or law, which the mind applies, as the workman does his rule, to ascertain whether the quality of the action be good or bad. But as we are conscious of no such process as the application of a general rule, there seems to be no evidence whatever of its existence. The real process of the mind is very simple. When a moral action is viewed, if its nature is simple and palpable, the mind intuitively perceives its quality, and is conscious of no other mental process. Suppose a man, created as Adam was, in the full possession of his rational faculties: until some occasion offered to elicit its exercise, he would not be conscious of any moral faculty or feeling. But suppose an act of flagrant injustice to be perpetrated before him, he would at once have his moral faculty brought into exercise. He would see that the action had in it a moral turpitude, that it ought not to have been done, and that the agent deserved to be punished. So long as this was the only moral act observed or thought of, there would be in the mind nothing but the judgment, with the accompanying feeling that such an act, and of course every other act of the same kind, was evil. As such an observer would, however, soon observe a multitude of acts, of different kinds, which were judged to be good or bad, a general rule or law would be obtained, by degrees, out of these particulars. The process of the mind, in all cases, is from particulars to generals, and the tendency in the mind to put into classes those things which resemble each other, exists also in regard to moral actions. After observing a great number of acts of different kinds, all of which are morally good or evil, these particulars are classified, and form a general rule or law; and when a new act is observed, it is referred to its proper class. But how can we know an action to be good or bad, without a rule with which to compare it, in the first

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instance? The answer is, that it is as easy to conceive of a faculty by which we can at once perceive the moral character of an act, as of the power of judging of the rectitude of a general rule.

There is a sense in which it may be said, that reason, or the moral faculty having the power of discerning the moral quality of actions, has the rule in itself. If this is all that is intended by a general rule of right and wrong in the mind, there can be no objection to it. This is saying no more than that the mind has a faculty by which it judges intuitively of many moral acts, as soon as they are observed. The idea may be thus illustrated: here is a straight line, as soon as we see it, we perceive it to be straight; there is a crooked line, which at once we perceive to be crooked. There is no need of a rule in the mind, by the application of which we know that the one is straight, and the other crooked. The quality of the lines is seen at once. So of many moral actions, the moment the mind apprehends them, their moral character is perceived.

Here are so many boys going to school. We observe one, who is large and strong, forcibly taking from another, who is small and weak, some fruit which the latter has with much pains gathered for a sick mother. We need no general rule to guide our judgment. We need only to know the real circumstances of the action. That a large and strong boy should by force take away from one weaker than himself, property to which he has no right, and to which the other has a right, is so evidently immoral, that every mind sees the evil at once.

The general law or rule of morals is therefore made up by the observation and classification of particular acts; just as the general law of gravity is formed by observation of particular facts.

All our knowledge relates originally to particular cases; and general ideas and general rules and laws, are formed by a process of the mind, which may be called generalisation or classification.

THE MORAL FEELING WHICH ACCOMPANIES EVERY MORAL JUDGMENT.

Whether our judgments and feelings are distinct and separate mental exercises, or whether what we call feeling or emotion is only an idea of a more vivid kind, is a question which we need not discuss, as the decision of it is not necessary to our purpose. All men make a distinction between acts which are purely intellectual, and those exercises of mind called emotions; and no practical error can arise from observing this distinction—whether philosophically correct or not. In every case where a moral object or relation comes before the mind, there is a feeling of approbation or disapprobation, according to the moral character of the object, of which we are immediately conscious. This approbation or disapprobation will not be equal in all cases, but exceedingly different in degree. While some moral actions elicit, when perceived, a very slight degree of approbation or disapprobation, others excite strong emotion, the disapproval arising to indignation, and the approval to admiration.

In every instance where a good act is observed, there is a feeling of esteem for the agent, as well as approbation of the act. A disposition, too, is felt to bestow some reward on the person who performs a good action. If we see a man, at the imminent risk of his own life, plunge into the sea to save a stranger who has fallen overboard, we approve the action, and feel that he deserves a reward. We therefore call it a meritorious action; for the simple idea of merit is that which deserves a reward.

On the other hand, when we are witnesses of a wicked act of an enormous kind, as, for example, a man murdering a good parent or a kind benefactor, without any provocation, but instigated by avarice or resentment—we feel instantaneously a degree of disapprobation which may properly be called indignation. This feeling would be accompanied by a strong desire that condign punishment should be inflicted on the wicked perpetrator of such a deed. If there were no other means of executing justice, we should feel disposed to aid in punishing the culprit; and the idea of such a person escaping without punishment, is painful to the impartial mind, and revolting to the moral feelings.

These moral emotions are, however, of very different degrees of intensity in different persons, and in the same persons at different periods of his life. Persons who have been long accustomed to see atrocious crimes committed, lose in time their moral sensibility, and become accustomed to scenes of blood and robbery. In proportion as the minds of men are enlightened by the truth, and their hearts upright, will be the sensibility of the moral faculty. But by committing sin, as well as by observing it, the moral sensibilities are blunted. This want of right feeling in the conscience is what is called a "seared conscience," which expression is borrowed from the effect produced on any part of the living body, by the repeated application of a heated iron. The result is, that, by degrees, the skin thickens, and the sensibility of the seared part is lost, or rendered obtuse.

Besides this feeling of approbation or disapprobation of moral acts, good or evil, there is a peculiar emotion, in relation to moral acts, according to their nature, when performed by ourselves. In this case, the emotion is much more vivid than when we contemplate the same action as performed by another. When a person is conscious of having performed a truly good action, and from the proper motives, he experiences an emotion of pleasure, of a very peculiar and exalted nature. For this emotion we have no distinctive name; it may be called the pleasure of a good or approving conscience. It must not be confounded with self-complacency, or a proud opinion of our own worth, which may also arise from the performance of a meritorious action. The feeling of which mention has been made, is a simple emotion arising in the mind, from the principles of the human constitution, upon the performance of a good action. One reason why it has not been more noticed is, that it has no distinctive name. The emotion experienced on the performance of a wicked action is well known to every one. It has a distinctive appellation—*remorse*. It is a feeling distinguishable from all others, and more intolerable than any other species of pain. When violent, it often drives the unhappy subject of it to the most desperate acts. It is like a scorpion, stinging the soul in its tenderest part. No language can exaggerate the misery of a soul abandoned to the torture of this feeling. And though in time it may seem to be allayed by forgetfulness of the crime, yet when any circumstance or association brings the evil action distinctly before the conscience, the torment is renewed. Thus, acts of iniquity committed in heedless gaiety, often produce sensible remorse in the time of solitude and reflection; and the sins of youth embitter old age. This feeling often accompanies the sinner to his times of decline, and is the pain which most annoys him on his bed of death. As the feeling accompanies the guilty unto the last moment of their earthly existence, there is much reason to think that it will cause the bitterest anguish of a future state.

BELIEF IN GOD, AS CONNECTED WITH THE OPERATION OF CONSCIENCE.

The question is, whether an atheist is completely divested of the feeling of moral obligation. To those who suppose that speculative atheism is impossible, this question will appear irrelevant; for it would be useless to inquire what would be the effect of a state of mind which never can exist.

As, however, the evidences of the actual existence of atheism are as strong as those of most other fundamental errors; and as the doctrine of certain ideas being impressed on the mind in its creation (on which the opinion that men could not become atheists was founded), is now generally exploded, it may be here taken as admitted that there are atheists in the world. The question proposed is therefore a proper subject for consideration. Bishop Warburton in his "Divine Legation of Moses," seems to adopt the opinion, that a belief in the being of God is requisite to the exercise of conscience, or the sense of moral obligation. But his reasonings on the subject are by no means satisfactory. If we may refer to the experience of the atheist himself, he will assure us, that he perceives the difference between right and wrong, as plainly as others, and that he is conscious of being under a moral obligation to pursue a virtuous course. This, however, they consider an instinctive or constitutional principle, which should be obeyed, just as our appetites and other natural propensities should be obeyed.

If there are intuitive perceptions of moral relations, when actions of a certain kind are presented to the view of the rational mind, then it is certain that conscience may and will operate, whatever may be the opinions of the person on other subjects. No one, when he contemplates an act of flagrant injustice, is conscious of a reference to the existence of a moral Governor, prior to his moral judgment of the quality of the action. The perception of its moral evil is as immediate as that of the colour of the sky, or the grass. But how can a man feel a moral obligation, unless he admits that there is a superior to whom he is bound? how can he feel himself under a law, unless there is a law-giver? The answer is, that this part of the human constitution furnishes a conclusive argument in favour of the being of God. We have a law written within us, and from the sense of obligation to obey his law we cannot escape. The great Creator has not left himself without a witness in the breast of every man. It is possible that a man may be so abandoned as to believe in lies, and that he may come to disbelieve in the God that made and supports him. But he cannot obliterate the law written on his heart; he cannot divest himself of the conviction that certain actions are morally wrong; nor can he prevent the stings of remorse, when he commits sins of an enormous kind. Men may, indeed, spin out refined metaphysical theories, and come to the conclusion that there is no difference between virtue and vice, and that these distinctions are the result of education. But let some one commit a flagrant act of injustice towards themselves, and their practical judgment will give the lie to their theoretical opinion.

As those speculatists who argue that there is no external world, will avoid running against a post, or into the fire, as carefully as other men; so they who endeavour to reason themselves into the belief that virtue and vice are mere notions, generated by education, cannot, nevertheless, avoid perceiving that some actions are base, unjust, or ungrateful, and consequently to be disapproved of, whether committed by themselves or others.

The inferences from what has been said are, that by no arts or course of conduct can men so eradicate the moral faculty, that there shall no longer be any sense of right and wrong. And again, it is evident that, although the belief of the existence of God is not necessary to the operations of conscience, yet from the existence of this faculty the existence of God may be inferred.

And finally, that although the atheist cannot destroy the moral faculty, yet the firmer the belief of God's existence, and the clearer the knowledge of his attributes, the more distinct and forcible will be the dictates of conscience. Moreover, while the blindness of atheism continues, there will of course be no perception of the moral duties which arise out of our relation to the great Creator; and thus the largest and most important class of moral actions will be out of view. And this is true, to a great degree, in regard to the practical atheist, who forgets God habitually; he feels very little sense of obligation to worship and serve him.

LESSONS IN FRENCH PRONUNCIATION.

No. III.

NAME AND SOUND OF THE VOWELS—*Continued.*

41. I i.

Name. Sound.

EE ee. Like the letters EE in the English word SEE.

This vowel receives but one kind of accent, and that is, the Circumflex, viz.:—I î; though it is comparatively seldom found thus accented. This vowel has two sounds, viz.,—long and short:—long, as EE, in the English word SEE; and short, like I in the English word PIN, or nearly like it. It becomes *nasal*, in combination with the letters M and N; in which case, the character of its own sound is completely changed, which is indeed true of all the vowels.

In these lessons, the vowel I i, will be represented by the two letters EE, when long or under the Circumflex accent, and by E, when it has the short sound.

EXAMPLES.

French.	Pronunciation.	English.
Cire	Seer	*Wax.*
Dire	Deer	*To Say.*
Dit	Dee	*Said.*
Il	Eel	*He.*
Iris	Ee-ris	*Iris.*
Lime	Leem	*File.*
Liquide	Lee-kid	*Liquid.*
Lire	Leer	*To read.*
Lit	Lee	*Bed.*
Mille	Meel	*Thousand.*
Qui	Kee	*Who.*
Rite	Reet (trill the r.)	*Rite.*

42. Î î Circumflex.

Name. Sound.

EE ee. Like the letters EE, in the English word SEE sound prolonged.

EXAMPLES.

French.	Pronunciation.	English.
Abîme	A-beem	*Abyss.*
Assît	A-see	*Might assist.*
Battît	Ba-tee	*Might beat.*
Dîme	Deem	*Tenth.*
Dîner	Dee-nay	*To dine.*
Epître	Ay-peetr'	*Epistle.*
Finît	Fe-nee	*Might finish.*
Gîte	Zheet	*Lodging-place.*
Île	Eel	*Island.*
Mît	Mee	*Might place.*

43. O o.

Name. Sound.

O o. Like the letter O in the English word ROB.

This vowel also receives but one kind of accent, which is the Circumflex, viz., Ô ô. Without and with this accent, this vowel has in reality but one sound, viz., like O in the word ROB; though, when it is accented, thus, Ô ô, the former sound becomes broader and prolonged. When final, it usually has the prolonged sound.

French.	Pronunciation.	English.
Bloc	Blok	*Block.*
Bodine	Bo-deen	*Keel.*
Botte	Bot	*Boot.*
Corde	Kord	*Cord.*
Corridor	Ko-ree-dor	*Gallery.*
Crosse	Kross	*Crosier.*
Gobelet	Gob'-lay	*Cup.*
Locale	Lo-kal	*Local.*
Mode	Mod	*Fashion.*
Morale	Mo-ral	*Moral.*
Mot	Mo (long o)	*Word*
Repos	R'-po (long o)	*Rest.*

44. Ô ô.

Name. Sound.

O o. Like the letter O, in the English word ROBE.

EXAMPLES.

French.	Pronunciation.	English.
Côte	Kote	*Hill.*
Dépôt	Day-po	*Storehouse.*
Dôme	Dome	*Dome.*
Drôle	Drole (trill the r)	*Rogue.*
Nôtre	Notr'	*Ours.*
Pôle	Pole	*Pole.*
Prévôt	Pray-vo	*Provost.*
Rôle	Role	*Part.*
Rôti	Ro-tee (trill the r)	*Roast-meat.*
Tôt	To	*Soon*
Trône	Trone	*Throne.*
Vôtre	Votr'	*Yours.*

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45. U u.

The sound of this vowel is peculiar, and very difficult for foreigners to obtain. We have no sound in the English language exactly like it. The nearest approch to it, is the sonnd of U in the last syllable in the English word PICAYUNE, when pronounced with the lips drawn forward, as if to whistle.

For instance; pronounce the word PICAYUNE in the most natural manner you can; now pronounce the last syllable of this word with the lips drawn forward and nearly closed. Do you not perceive a difference in the sound, when produced in this latter manner, from that produced in speaking the last syllable naturally? The sound produced with the lips drawn forward and nearly together, embraces the correct sound of the most difficult of all sounds—to the Englishman at least—the sound of the French U u. Let us now take away from the sound of the syllable YUNE, the sounds of all the letters except that of U u, viz.: pronounce first, YUNE, then pronounce UNE: and, finally, pronounce U with the lips nearly closed and drawn forward. This last is the sound of the vowel we want to acquire.

It must be acknowledged, however, that the English letter U, does not represent the correct sound of the French U, which is a combination of sounds not recognised in our language. Still, we must use it as the representative of the sound of the French U, for the want of a better one.

The following rule has also been given and found useful.

The sound of the French U, is based upon that of English E. Pronounce the English letter E as naturally as possible, observing at the same time the position of the internal organs of the mouth. Now keep these organs in the same position as nearly as possible; protrude the lips as if to whistle, drawing them nearly together at the same time, and then try to pronounce the English E again, which will give you the correct sound of the French U.

Practise often ALOUD, according to the directions of this Rule, and success will crown your efforts. The rule has never yet failed to impart the correct sound of the French U in this manner, when seconded by the *patient*, PERSEVERING, and DETERMINED efforts of the pupil.

Name.	Sound.
U u.	Like the letter U, in the English word PICAYUNE.

EXAMPLES.

French.	Pronunciation.	English.
But	Bu	*Aim.*
Elu	Ay-lu	*Elect.*
Justice	Zhue-tes	*Justice.*
Lune	Lune	*Moon.*
Nature	Na-ture	*Nature.*
Plus	Plu	*More.*
Tribu	Tre-bu	*Tribe.*
Tribune	Tre-hune	*Gallery.*
Une	Une	*One.*
Unité	U-nee-tay	*Unity.*
Urne	Urne	*Urn.*
Vertu	Ver-tu	*Virtue.*

46. Û û CIRCUMFLEX

Name.	Sound.
U u.	Like the letter U in the English word PICAYUNE,—sound prolonged.

EXAMPLES.

French.	Pronunciation.	English.
Bûche	Bush	*Log of wood.*
Brûlable	Bru-labl'	*That is to be burnt.*
Brûlot	Bru-lo	*Fireship.*
Brûler	Bru-ley	*To burn.*
Crû	Kru	*Growth.*
Dû	Du	*Due.*
Flûte	Flute	*Flute.*
Fût	Fu	*A cask.*
Mûre	Mure	*Ripe.*
Sûreté	Sur-tay	*Safety.*
Sûr	Sure	*Certain.*

47. Y y.

Name.	Sound.
EE ee.	Like the tho letters EE, in the English word BEE.

This latter is also a *word*; that is, it is one of the parts of speech in the French language. It is usually an adverb, meaning *there*. It is also used as a Noun, and a Pronoun.

When Y stands alone, and thus becomes a word, its pronunciation is invariably like that of the letters EE in the English word BEE, viz.:—Il y a—pronounced Eel ee a: this last A must be sounded like A, in the English word PAT.

Y, is also pronounced like the letters EE in the English word BEE, when it BEGINS or ENDS a word; and also *when it occurs in the body of a word*, AFTER A CONSONANT, viz.:—

French.	Pronunciation.	English.
Dey	Da-ee *or* Da-y	*Day.*
Style	Steel	*Style.*
Système	Seess-taim	*System.*
Yole	Ee-ol *or* E-ol	*A yawl.*

Whenever Y is found in the body of a word, BETWEEN TWO VOWELS, it has the sound of two French i's, that is, of two double e's, viz.:—

MOYEN, should be pronounced as if printed thus, viz.: Moïen; divided thus, viz.: Moi-i-en, but pronounced in two syllables, viz.: Moi-ien.

JOYEUX, should be pronounced as if printed thus, viz.: Joïeux; divided thus, viz.: Joi-i-eux, but pronounced in two syllables, viz.: Joi-ieux.

ROYAUME, should be pronounced as if printed thus, viz.: Roïaume; divided thus, viz.: Roi-i-aume, but pronounced in two syllables, viz.: Roi-iaume.

The pupil need not attempt to pronounce these three French words used as examples, because the combination of vowels and other letters occurring in them, has not yet been illustrated.

The pronunciation of Y with these and other combinations of letters will be explained in future lessons.

In the two following words, the Y, *though not placed between two vowels*, is under the same Rule, viz.:

PAYS, meaning, A COUNTRY, should be pronounced as if printed Païs; divided thus, viz.: Pai-is, and pronounced PA-EE.

PAYSAGE, meaning, A LANDSCAPE, should be pronounced as if printed Païsaoe; divided thus, viz.: Pai-i-saoe, and pronounced PA-EE ZAZH.

LESSONS IN ITALIAN GRAMMAR.—No. XXXV.

IX.

Piacère, to please.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *piacère*, to please	Past: *avère piaciuto*, to have pleased
Present Gerund: *piacéndo*, pleasing	Past Gerund: *avéndo piaciúto*, having pleased
Past Participle: *piaciúto*, pleased	

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INDICATIVE MOOD.

Present.

Piáccio or *piácio*, I please
piáci, thou pleasest
piáce, he pleases
piacciámo or *piaciámo*, we please
piacéte, you please
piácciono or *piáciono*, they please

Imperfect.

Piacéva, I pleased
piacévi, thou pleasedst
piacéva, he pleased
piacevámo, we pleased
piacevate, you pleased
piacévano, they pleased

Indeterminate Preterite.

Piácqui, I pleased
piacésti, thou pleasedst
piácque, he pleased
piacémmo, we pleased
piacéste, you pleased
piácquero, they pleased

Future.

Piacerò, I shall or will please
piacerái, thou wilt please
piacerà, he will please
piacerémo, we will please
piaceréte, you will please
piacerànno, they will please

Conditional Present.

Piacerèi or *piacería*, I should or would please
piacerésti, thou wouldst please
piacerèbbe or *piacería*, he would please
piacerémmo, we would please
piacerèste, you would please
piacerèbbero, *piacerían*, *piacerísno*, they would please

IMPERATIVE MOOD.

[No First Person.]
Pídci, please (thou)
piáccia or *piácia*, let him please
piacciámo or *piaciámo*, let us please
piacéte or *piacciáte*, please (ye or you)
pídciano or *pídciano*, let them please

SUBJUNCTIVE MOOD.

Present.

Che piáccia or *piácia*, that I may please
che piáccia, *piácci* or *piáci*, that thou mayst please
che piáccia or *piácia*, that he may please
che piacciámo or *piaciámo*, that we may please
che piacciáte or *piacidte*, that you may please
che piácciano or *piáciano*, that they may please

Imperfect.

che piacésse, that I might please
che piacéssi, that thou mightst please
che piacésse, that he might please
che piacéssimo, that we might please
che piacéste, that you might please
che piacéssero, that they might please

So conjugate—

Compiacére, to please
Dispiacére, to displease
Ripiacére, to please again
Spiacére, to displease

X.

Potére, to be able.

INFINITIVE MOOD.

Simple Tenses.

Present: *potére*, to be able
Present Gerund: *poténdo*, being able
Past Participle: *potúto*, been able

Compound Tenses.

Past: *avére potúto*, to have been able
Past Gerund: *avéndo potúto*, having been able

INDICATIVE MOOD

Present.

Pósso I am able, or I can
puói or *puó*, thou art able
puó, *puóte* or *póte*, he is able
possiámo or *potiámo*, we are able
potéte, you are able
péssono, *pónno* or *pon*, they are able

Imperfect.

Poléva or potéa, I was able, or I could
potévi, thou wast able
poléva, *potéa* or *potía*, he was able
potevámo, we were able
potevate, you were able
potévano, *potíeno* or *potéano*, they were able

Indeterminate Preterite.

Potéi or *potè*, I was able, or I could
potésti, thou wast able
potè or *potéo*, he was able
potémmo, we were able
potéste, you were able
potérono, *potéttero*, *potévo* or *potér*, they were able

Future.

Potrò, I shall or will be able
potrai, thou wilt be able
potrà, he will be able
potrémo, we will be able
potréte, you will be able
potránno, they will be able

Conditional Present.

Potréi, *potría* or *poría*, I should or would be able
potrésti, thou wouldst be able
potrébbe, *potría* or *poría*, he would be able
potrémmo, we would be able
potrés e, you would be able
potrébbero, *potríano*, *poríano* or *potríeno*, they would be able

[No Imperative.]

SUBJUNCTIVE MOOD.

Present.

Che pósca, that I may be able
che póssa, that thou mayst be able
che póssa, that he may be able
che possiámo, that we may be able
che possiáte, that you may be able
che póssano, that they may be able

Imperfect.

Che potéssi, that I might be able
che potéssi, that thou mightst be able
che potésse, that he might be able
che potéssimo, that we might be able
che potéste, that you might be able
che potéssero, that they might be able

XI.

Rimanére, to remain.

INFINITIVE MOOD.

Simple Tenses.

Present: *rimane're*, to remain
Present Gerund: *rimane'ndo*, remaining
Past Participle: *rimáso*,[a] remained

Compound Tenses.

Past: *é'ssere rimáso*, to have remained
Past Gerund: *esse'ndo rimáso*, having remained

INDICATIVE MOOD.

Present.

Rimango,[a] I remain
rimáni, thou remainest
rimáne, he remains
rimaniámo, we remain
rimane'te, you remain
rimángono, they remain

Imperfect.

Rimane'va, I was remaining
rimane'vi, thou wast remaining
rimane'va, he was remaining
rimanevámo, we were remaining
rimanevate, you were remaining
rimane'vano, they were remaining

Indeterminate Preterite.

Rimási, I remained
rimane'sti, thou remainest
rimáse, he remained
rimane'mmo, we remained
rimane'ste, you remained
rimásero, they remained

Future.

Rimarrò, I shall or will remain
rimarrái, thou wilt remain
rimarrà, he will remain
rimarrs'mo, we will remain
rimarre'te, you will remain
rimarránno, they will remain

Conditional Present.

Rimarre'i or *rimarría*, I should or would remain
rimarre'sti, thou wouldst remain
rimarre'bbe or *rimarría*, he would remain
rimarre'mmo, we would remain
rimarre'ste, you would remain
rimarre'bbero, they would remain

[a] *Rimáso* is used in a familiar style; but as *rimáse* is more elegant, we advise the student always to prefer the latter.
[a] *Rimágno*, mentioned by some Italians, is not good.

IMPERATIVE MOOD.

[No First Person.]	*rimaniámo*, let us remain
Rimáni, remain (thou)	*rimané'te*, remain (ye or you)
rimánga, let him remain	*rimángano*, let them remain

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che rimánga or *rimágna*, that I may remain	*Che rimané'ssi*, that I might remain
che rimángs or *rimágna*, that thou mayst remain	*che rimanéssi*, that thou mightst remain
che rimánga, that he may remain	*che rimané'sse*, that he might remain
che rimaniámo, that we may remain	*che rimané'ssimo*, that we might remain
che rimaniáte, that you may remain	*che rimané'ste*, that you might remain
che rimángano, that they may remain	*che rimané'ssero*, that they might remain

XII.

Sapére, to know.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *sapére*, to know	Past: *avére sapúto*, to have known
Present Gerund: *sapéndo*, knowing	Past Gerund: *avéndo sapúto*, having known
Past Participle: *sapúto*, known	

INDICATIVE MOOD.

Present.	*sapéste*, you knew
Sò, I know	*séppero*, they knew
sái, thou knowest	Future.
sà or *sápe*, he knows	*saprò*, I shall or will know
sappiámo, we know	*saprái*, thou wilt know
sapéte, you know	*saprà*, he will know
sánno, they know	*saprémo*, we will know
Imperfect.	*sapréte*, you will know
Sapéva or *sapéa*, I knew	*sapránno*, they will know
sapévi, thou knewest	Conditional Present.
sapéva or *sapéa*, he knew	*Saprèi* or *saprìa*, I should or would know
sapevámo, we knew	*saprésti*, thou wouldst know
sapeváte, you knew	*saprébbe* or *saprìa*, he would know
sapévano or *sapéano*, they knew	*saprémmo*, we would know
Indeterminate Preterite.	*sapréste*, you would know
Séppi, I knew	*saprébbero*, *saprìano* or *saprièno*, they would know
sapésti, thou knewest	
séppe, he knew	
sapémmo, we knew	

IMPERATIVE MOOD.

[No First Person].	*sappiámo*, let us know
Sappi, know (thou)	*sappiáte*, know (ye or you
sappia, let him know	*sáppiano*, let them know

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che sáppia, that I may know	*Che sapéssi*, that I might know
che sappìa, that thou mayst know	*che sapéssi*, that thou mightst know
che sáppia, that he may know	*che sapésse*, that he might know
che sappiámo, that we may know	*che sapéssimo*, that we might know
che sappiáte, that you may know	*che sapéste*, that you might know
che sáppiano, that they may know	*che sapéssero*, that they might know

So conjugate—

Assapére, to let one know	*Risapére*, to know again
Antisapére, to foresee	*Strasapére*, to be too knowing

VOCABULARY.

Domandáre, to ask, demand	*vossignoría*, your lordship, sir
perchè, why, wherefore (French *pourquoi*), because	*dolére*, to grieve, complain
sposáre, to marry	*carestía*, scarcity, famine
sordo,—a, deaf	*fièno*, hay
il quale, who, which	*biáda*, corn
rispondére, to answer	*anno*, a year
tale, such	*morire*, to die
credére, to believe	*molto,—a*, much; pl. many
tempo, time	*béstia*, a beast, animal
col tempo, in time	*fame*, hunger, famine
dovére, to be obliged; (with another verb) ought, must	*Dio*, God
anche, also	*guardare*, to guard, preserve
diventáre, to become	*ricco*, rich
mútolo,—a, dumb	*fare*, to make; with another verb, to cause, get or have done, e.g. *fare effigiáre*, to get or have represented
gentiluómo, gentleman	*effigiáre*, to form, represent
volére, to be willing, to wish	*marmo*, marble
scherzáre, to joke	*mostrare*, to show
con, with	*figúra*, figure
astúto,—a, sharp, cunning	*amico*, a friend
barbiére, a barber	*se*, if, whether
vicino, a neighbour	*scultóre*, a sculptor
gli, to him	*bene*, well
dire, to say	*incontrére*, to meet, catch
quanto,—a, how much; pl. how many	*rassomiglianza*, resemblance, likeness
goffo, a fool, simpleton	*altro,—a*, other
vostro,—a, your	*perfettaménte*, perfectly
strada, street	*certo*, certain, certainly
ne, of or from it, or them	*vi*, to you, you
incírca, about	*rassomigliáre*, to resemble
dozzina, a dozen	*ánima*, mind
senza, without	*corpo*, body
contáre, to count, reckon	

EXERCISES.

Fù domandáto ad uno, perchè avésse sposáto una sorda? Il quale rispóse: La sposái tale, credéndo che col tempo dovésse anche diventár mútolo.

Un gentiluómo voléndo scherzáre con un astúto barbiére, suo vicíno, gli disse: Quanti goffi siéte nella vostra strada? Al quale il barbiére rispóse: Ne siámo incírca una dozzína senza contáre vossignoría.

Doléndosi uno delle carestía del fiéno, e delle biáda, disse che in quel anno ne morirébbero molte béstie di fame; a cui rispóse un' altro, E Dio ne guardi vossignoría.

Un ricco goffo esséndosi fatto effigiár in marmo, mostrò quello figúra ad un amico suo, egli domandò se lo scultóre avéva ben incontráto la rassomiglianza? A cui l' altro rispóse, Perfettaménte certo, perchè vi rassomiglia in ánime e in corpo.

LESSONS IN GREEK.—No. XLIX.

By JOHN R. BEARD, D.D.

SYNTAX;

PRELIMINARY EXPLANATIONS; SUBJECT; PREDICATE; AGREEMENT; GOVERNMENT.

We pass on to the consideration of Syntax. The word Syntax comes from the Greek *συντάξις*, which signifies an orderly arrangement. Syntax, therefore, is the science which teaches

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the orderly arrangement of words. The order here implied is the order of the thoughts, for words are uttered thoughts. Syntax, therefore, has its basis and its reason in logic, which expounds the natural laws of thought. Now, if you analyse a proposition, you will find that in its simplest state, a proposition or statement, called also a sentence or declaration, contains a subject, and something that is said of that subject. Take as an instance—

ἡ γυνη εστι καλη
the woman is fair.

Here ἡ γυνη is the subject. Of that subject it is said that it (she, ἡ γυνη) is fair, εστι καλη. We have then here two things to be considered, namely, ἡ γυνη and εστι καλη. The former is the subject of the sentence, inasmuch as it is that of which something is declared. The latter is called the predicate of the sentence, inasmuch as it is that which is predicated or declared of the subject. Now, observe the subject consists of two words, ἡ and γυνη; the article and a noun. You may, however, have a subject without an article, as

γυνη τρεχει
a woman runs.

The predicate also consists of two words, namely, εστι καλη; a verb and an adjective. The verb is a part of the substantive verb εἰναι, or the verb which denotes existence; the verb which affirms one thing of another, a quality of a subject. Here the verb εστι predicates καλη of γυνη. The verb εἰναι (or a verb of similar import, as γίγνεσθαι), united with an adjective forms what is called the predicate of a proposition; or that which is declared of the subject. Two things are requisite in a predicate, namely, a verb and an adjective; an adjective expressive of the attribute (hence called *the attribute*, and hence adjectives so circumstanced are termed *attributives*) or quality ascribed to the subject, and a verb which performs the office of ascribing or referring the quality to the subject. The verb as connecting the attribute with the subject, is called the *copula*, or link. Here, then, I present to you, with their logical designations, two

Simple Sentences.

	Subject.	*Predicate.*	
		Copula.	*Attribute.*
1.	ἡ γυνη	εστι	καλη
2.	γυνη		τρεχει

The second sentence you will see is logically equivalent to the first. In consequence, τρεχει contains in itself a copula and an attribute, and is in itself the predicate of the proposition.

Without these parts you cannot have a complete proposition. I mean you cannot have a complete proposition without a subject and a predicate. Every predicate must either contain a verb, or be a verb, inasmuch as it is the function of the verb to make an affirmation. If in the first sentence you drop εστι, you have no affirmation, and consequently no sentence. Yet, especially in the Greek language, the copula is often understood; in other words, it exists in the mind and does not appear in the utterance or in the writing; many examples have appeared in the foregoing exercises. Again, if you drop καλη, the attribute, then no full statement is made; *the woman is*—is what? The sentence is incomplete. The verb εἰναι may, however, denote simply existence, and then does not take an attribute, as *God is*, that is, *God exists*, Θεος εστιν.

Elvm with an attribute ὁ Θεος εστιν αγαθος *God is good*
—— without —— ὁ Θεος εστιν or εστιν ὁ Θεος. *God exists*

If, now, you drop ἡ γυνη, than you hava no subject, and consequently nothing of which a declaration can be made; e.g.—εστι καλη, *is fair*; *who* is fair. Tha sentence is incomplete.

Instead of the intransitive verb τρεχει, I will put a transitive verb, and then you will see another element of thought appears.

Subject.	*Predicate.*	*Object.*
ἡ γυνη	τυπτει	τον υἱον
the woman	*strikes*	*the (her) son.*

Here you have to contemplate what I have termed *the object*, namely, τον υἱον. The object is so named because it is the object of the action of the verb, that thing or being on which the action of the verb falls; the object struck is here *the son*. The actual object has the article *the* before it. Tha article is not indispensable; here the object might have stood thus—

Subject.	*Predicate.*	*Object.*
ἡ γυνη	τυπτει	παῖδα
the woman	*strikes*	(a) *boy.*

In these simple statements you have the essential elements; first of all Syntax, and secondly and specifically of all the Greek Syntax. Syntax has nothing else to do than to show in detail what is here set forth generally. With each of these elements Syntax has to deal; with each of them separately; with all of them unitedly. It is the office of Syntax to show how each part may be modified, and how the several parts must grammatically stand to each other.

Greek Syntax then, you see, presents itself under two aspects; first, as Syntax in general, and secondly, as general Syntax modified by the peculiar usages or the peculiar forms of expression (words) of the Greek. It suffices for our purpose to point out this distinction. We shall treat of general Syntax as it appears in a particular form, namely, as observed by the best Greek prose writers.

Of Greek Syntax the essential laws are implied in the sentences just given. Look, again, at the first sentence. You see that the predicate is in one sense identical with the subject; for the attribute *fair* belongs to or inheres in the woman; εστι is merely the connecting link. The copula identifies the two. This will be soon evident if you change the form a little; as

ἡ	καλη	γυνη	εστιν	ἐκεῖ
tha	*fair*	*woman*	*is*	*there.*

Here καλη and γυνη are brought together so as to show that the two belong to the subject of which we speak. That subject is not simply γυνη, *a woman*, or any woman; nor is it γυνη τις, *a certain woman*; but ἡ καλη γυνη, the *fair* woman. Consequently, καλη and γυνη refer to the same person, and referring to the same person they combine to describe that person. As they then agree so as to be one in fact or in thought, so must they agree so as to be one in form. Hence arises the first concord, namely, that

Adjectives must agree with their substantives in gender, number, and case.

I have added the words "in gender, number, and case," in order to present the rule complete at once. The reason of that addition you will see in the fact that in Greek, substantives and adjectives undergo changes in gender, number, and case. But that reason is grounded in the nature of things. Take gender first. Γυνη is of the feminine gender, therefore have I written καλη. Had I written καλος, I should have connected a masculine adjective with a feminine noun, and committed the solecism of declaring *the woman* a fair *man*. Had I written καλον, I should have said that the woman was a fair *thing*; a form of speech allowable only if I had wished to express contempt of the particular woman referred to.

In the second place, advert to number. Suppose I had written καλαι; then I should have made the woman at once singular and plural; intimating that she was one and more than one person. In the third place, had I written καλης, I should have produced a different sense, for, by disconnecting καλη from γυνη, the predicate from the subject, I should have

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said something of this kind—"the woman is (the daughter, or the mother) *of* the fair one."

Similar remarks would serve to show that the article (which is a species of adjective—a qualifying, that is, determinative word) must also agree in form with its noun, seeing that it of necessity agrees in sense, both referring to the same object.

As adjectives and substantives which agree in sense must agree in form, so

The subject must agree with its verb.

If, for instance, I had put before the verb εστι a plural subject, as *αι γυναικες*, saying the *women is* fair, then I should have represented the subject as at the same time plural and singular, intimating that it was plural by the form of the noun and the form of the adjective; and intimating that it was singular by the form of the verb. Similarly erroneous would it have been had I written εισι (*they are*) for εστι (*she is*).

We now come to case. Take the example—

ἡ γυνη τυπτει τον υἱον.

Here *τον υἱον* is in the accusative case, illustrating the fact that τυπτω is one of those verbs which require their object to be in the accusative case. Other verbs place the object in the genitive case, and others in the dative case. In either the accusative, the genitive, or the dative case must every object be. Consequently a noun found in either one of these cases is known to be an object—an object governed by a preposition if not by a verb. In the sentence given above, then, I know that *τον υἱον* is the object, or receives the action implied in *τυπτει*, because it is in the case of the object, the objective or accusative case. Instead of being *τον υἱον*, were it ὁ υἱος, I should not know which of the two, ἡ γυνη or ὁ υἱος, was the subject. And if ἡ γυνη were *την γυναικα*, then ὁ υἱος remaining the same, the sense would be *the son struck the mother*; for in Greek the sense depends on the form of the words, not their arrangement.

Now then suppose that I had written *την γυναικα εστι καλη*. I should have rendered *καλη* from *γυνη*, making the subject an object, for it is in one of the cases in which the object appears. Had I written ἡ γυνη εστι *καλην*, I should have employed an object *καλην*, without any verb or preposition to govern it.

Observe, moreover, that *καλη* is in the same case as *γυνη*, though a verb comes between them. That verb is εστι. Hence you may infer, as a general rule, that the verb *εἰναι* has the same case after it as before it; the reason is found in the fact already mentioned, that *εἰναι*, as a copula, merely unites the attribute with the subject. Indeed, whether, as here, the adjective is an attribute, or whether it is an epithet immediately qualifying the noun, the adjective must agree with the noun in gender, number, and case.

The parts of a sentence thus explained may be variously modified.

1. The article may be dropped, and then you have *γυνη εστι καλη*. The article becomes plural if the noun is plural; it may also pass into the dual number to agree with the noun.
2. The subject may be in either the plural or the dual number.
3. If the subject is changed so as to be in the plural or dual number, the verb must also be changed.
4. The verb may undergo changes, passing into the dual or the plural, in order to correspond to the subject.
5. If the subject is in the dual or the plural number, the attribute is changed into the corresponding number.

Also in the second sentence, ἡ γυνη *τυπτει τον υἱον*, many similar changes may be made in the subject, the verb, and the object. Besides changes like those just pointed out, the subject may be involved in the verb, being indicated by the person-ending, as

τυπτω τον υἱον
I strike my son

where subject and verb blend together in τυπτω. Another change may be undergone, for the verb may contain the whole of the predicate, as is the case in intransitive verbs; whereas in the previous case, the predicate involves the object; e. g.

Subject.	*Predicate.*	
	Verb.	*Object.*
ἡ γυνη	τυπτει	τον υἱον or
	copula attributa	
ἡ γυνη	εστι τυπτουσα	τον υἱον.

for so may *τυπτει* be resolved. If now I put down in Greek the changes indicated in the other sentence, you will have the whole before you at one view.

1.	ἡ γυνη	εστι	καλη
2.	γυνη	εστι	καλη
3.	αἱ γυναικες	εἰσι	καλαι
4.	τα γυναικε	ἐντον	καλα.

These preliminary explanations contain the substance of the Greek Syntax. Other observations, particulars, and rules, are only the expansion and the application of these general principles.

Take an illustration of the fact in an expansion of the sentence, ἡ γυνη *τυπτει τον υἱον*. You may make this simple sentence into a compound sentence, by adding another verb, e. g.

ἡ	γυνη	προσκαλεῖ	και	τυπτει	τον	υἱον
the	woman	calls	and	strikes	her	son.

Here we have what is equivalent to two sentences, a compound sentence, that is, consisting of two members, which two members if expressed in full, would be two sentences; e. g.

1.	ἡ	γυνη	προσκαλεῖ	τον υἱον
2.	ἡ	γυνη	τυπτει	τον υἱον.

By adding another verb we should add that which would make the compound sentence equivalent to three simple sentences. Indeed *totidem verba, totidem sententiæ*; that is, in English, as many verbs as you use, so many sentences you have.

These two sentences may, however, be reduced to a simple sentence by changing one of the verbs into a participle, thus

ἡ	γυνη	προσκαλεσαμενη	τυπτει	τον	υἱον
the	woman	calling (him)	strikes	her	son.

You may also expand the other components of the sentence, e. g.

The Subject	ἡ	κακη	γυνη	τυπτει	τον	υἱον
	the	*bad*	woman	strikes	her	son.
The Verb	ἡ	γυνη	δεινως	τυπτει	τον	υἱον
	the	woman	*severely*	strikes	her	son.
The Object	ἡ	γυνη	τυπτει	τον	απειθη	υἱον
	the	woman	strikes	her	*disobedient*	son.

A secondary subject may be introduced, as

ἡ	γυνη,	ἡ Ασπασια καλουμενη,	τυπτει	τον	υἱον
the	woman,	*who is called Aspasia,*	strikes	her	son.

This instance illustrates what is called *apposition*; apposition takes place when a noun is added to a noun, the second being in the same case as the first, by way of explanation, that is, in order to state who or what is meant.

A secondary object may be introduced; e. g.

ἡ	γυνη	τυπτει	τον	υἱον	ἑνεκα	της απειθειας
the	woman	strikes	her	son	*on account*	*of his disobedience.*

The secondary object may relate to place and so qualify the verb, as

ἡ	γυνη	ἐν	τῳ	οἰκῳ	τυπτει	τον υἱον
the	woman				strikes	her son *in the house.*

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I may exhibit these facts to you thus

	Subject.	*Verb.*	*Object.*
Primary	ἡ γυνη	τυπτει	τον υἱον
Secondary	ἡ Ασπασια		ἐν τῳ οἰκῳ
,,	καλουμενη		ἑνεκα τῆς ἀπειθιας.

You will readily see how each of the principal parts may be extended; thus you may prefix an adjective to γυνη; you may qualify the verb by an adverb, and you may qualify the object by an epithet. As the primary, so also the secondary subject and object may be qualified; the verb may also be doubled, or a participle may be introduced instead of a second verb, or together with a second verb; and thus the simple sentence may be expanded into a compound sentence, and give you an instance of what the Grammarians meant when they termed a sentence or the expression of a thought, a *period* or a circle (περίοδος). I here give the sentence in an expanded form, as a period or compound sentence:—

Η κακη γυνη, ἡ Ασπασια καλουμενη, προσκαλεσασα τον ἀπειθη υἱον, ἐν τῳ οἰκῳ, ἑνεκα τῆς ἀπειθιας, λοιδορεῖ και τυπτει ἰσχυρῶς.

This period may be presented in a state of analysis thus:

	Subject.	*Verb.*	*Object*
Primary	ἡ γυνη	λοιδορεῖ	τον υἱον
Secondary	ἡ Ασπ. καλ.	(και) τυπτει	ἐν τῳ οἰκῳ, ἑνεκα τῆς ἀπειθ.
Qualifiers	προσκαλεσασα	ἰσχυρῶς	ἀπειθη.

By "qualifiers," is meant the words which qualify the import or extent of the subject, the verb or the object. Among the qualifying words, I might have placed ἡ and τον; the και merely unites the two verbs; which are the representatives of two sentences, for the whole is equivalent to

First Sentence	ἡ	γυνη	λοιδορεῖ	τον	υἱον
Second Sentence	ἡ	γυνη	τυπτει	τον	υἱον

and may be made into three sentences, thus:

Third Sentence	ἡ	γυνη	προσκαλεῖ	τον	υἱον.

The sentence thus enlarged brings permanently into view what in grammar is called government. One word is said to govern another, when the second is dependent on the first, and undergoes some inflectional change under the influence of the first. Thus the nominative υἱος is changed into the accusative υἱον by the verb τυπτει, on which it depends, and by which therefore it is said to be governed. In the same way ἀπειθης becomes ἀπειθη under the operation of the verb τυπτει, and in order to agree with υἱον. So the prepositiou ἐν changes οἰκος into οἰκῳ, and οἰκῳ is said to be governed in the dative case by the preposition ἐν. For the same reason ἀπειθια appears in the genitive case, ἀπειθιας, because it depends on ἑνεκα, which requires its object to be in the genitive.

LESSONS IN ALGEBRA.—No. XXIII.

(*Continued from page* 28.)

DIVISION OF RADICAL QUANTITIES.

The division of radical quantities may be expressed by writing the divisor under the dividend, in the form of a fraction.

1. Thus the quotient of $\sqrt[3]{a}$ divided by $\sqrt{b}$ is $\frac{\sqrt[3]{a}}{\sqrt{b}}$.

2. And $(a+h)^{\frac{1}{2}}$ divided by $(b+x)^{\frac{1}{n}}$ is $\frac{(a+h)^{\frac{1}{2}}}{(b+x)^{\frac{1}{n}}}$.

In these instances, the radical sign or index is *separately* applied to the numerator and denominator. But if the divisor and dividend are reduced to the *same* index or radical sign, this may be applied to the *whole* quotient.

3. Thus $\sqrt[n]{a} \div \sqrt[n]{b} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$. For the root of a fraction is equal to the root of the numerator divided by the root of the denominator.

4. Again, $\sqrt[n]{ab} \div \sqrt[n]{b} = \sqrt[n]{a}$. For the product of this quotient into the divisor is equal to the dividend; that is, $\sqrt[n]{a} \times \sqrt[n]{b} = \sqrt[n]{ab}$. Hence—

Quantities under the same radical sign or index, may be divided like rational quantities, the quotient being placed under the common radical sign or index.

5. Divide $(x^3y^3)^{\frac{1}{2}}$ by $y^{\frac{1}{2}}$.

These reduced to the same index are $(x^3y^3)^{\frac{1}{2}}$ and $(y^3)^{\frac{1}{2}}$.

And the quotient is $(x^3)^{\frac{1}{2}} = x^{\frac{3}{2}} = x^1$. Ans.

6. Divide $\sqrt{6a^3x}$ by $\sqrt{3x}$.

7. Divide $\sqrt{dhx^2}$ by $\sqrt{dx}$.

8. Divide $(a^3+ax)^{\frac{1}{2}}$ by $a^{\frac{1}{2}}$.

9. Divide $(a^3h)^{\frac{1}{m}}$ by $(ax)^{\frac{1}{m}}$.

10. Divide $(a^2y^3)^{\frac{1}{2}}$ by $(ay)^{\frac{1}{2}}$.

A root is divided by another root of the same letter or quantity, by subtracting the index of the divisor from that of the dividend.

11. Thus $a^{\frac{1}{2}} \div a^{\frac{1}{3}} = a^{\frac{1}{2}-\frac{1}{3}} = a^{\frac{3}{6}-\frac{2}{6}} = a^{\frac{3}{6}} = a^{\frac{1}{2}}$.

For $a^{\frac{1}{2}} = a^{\frac{3}{6}} = a^{\frac{1}{6}} \times a^{\frac{1}{6}} \times a^{\frac{1}{6}}$ and this divided by $a^{\frac{1}{3}}$ is

$$\frac{a^{\frac{1}{6}} \times a^{\frac{1}{6}} \times a^{\frac{1}{6}}}{a^{\frac{1}{3}}} = a^{\frac{1}{6}} \times a^{\frac{1}{6}} = x^{\frac{2}{6}} = a^{\frac{1}{3}}.$$

12. In the same manner, $a^{\frac{1}{m}} \div a^{\frac{1}{n}} = a^{\frac{1}{m}-\frac{1}{n}} = a^{\frac{n-m}{mn}}$.

13. Divide $(3a)^{\frac{1}{12}}$ by $(3a)^{\frac{2}{3}}$.

14. Divide $(ax)^{\frac{2}{3}}$ by $(ax)^{\frac{1}{3}}$.

15. Divide $a^{\frac{m+m}{n\,m}}$ by $a^{\frac{1}{m}}$.

16. Divide $(b+y)^{\frac{2}{n}}$ by $(b+y)^{\frac{1}{n}}$.

17. Divide $(r^2y^2)^{\frac{2}{3}}$ by $(r^2y^3)^{\frac{2}{3}}$.

Powers and roots of the same letter may also be divided by each other, according to the preceding article.

18. Thus $a^2 \div a^{\frac{1}{3}} = a^{2-\frac{1}{3}} = a^{\frac{5}{3}}$. For $a^{\frac{5}{3}} \times a^{\frac{1}{3}} = a^{\frac{6}{3}} = a^2$.

When radical quantities which are reduced to the same index, have rational co-efficients, the rational parts may be divided separately, and their quotient prefixed to the quotient of the radical parts.

19. Thus $ac\sqrt{bd} \div a\sqrt{b} = c\sqrt{d}$. For this quotient multiplied into the divisor is equal to the dividend.

20. Divide $24x\sqrt{ay}$ by $6\sqrt{a}$

21. Divide $18dh\sqrt{bx}$ by $2h\sqrt{x}$.

22. Divide $by(a^2x^2)^{\frac{1}{n}}$ by $y(ax)^{\frac{1}{n}}$.

23. Divide $16\sqrt{32}$ by $8\sqrt{4}$.

24. Divide $b\sqrt{xy}$ by $\sqrt{y}$.

25. Divide $ab(x^2b)^{\frac{1}{3}}$ by $a(x)^{\frac{1}{2}}$.

These reduced to the same index are $ab(x^2b)^{\frac{1}{3}}$ and $a(x^2)^{\frac{1}{3}}$.

The quotient then is $b(b)^{\frac{1}{3}} = (b^4)^{\frac{1}{3}}$.

To save the trouble of reducing to a common index, the division may be expressed in the form of a fraction.

The quotient will then be $\frac{ab(x^2b)^{\frac{1}{3}}}{a(x)^{\frac{1}{2}}}$.

Hence we deduce the following

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GENERAL RULE FOR DIVIDING RADICALS.

If the radicals consist of the same letter or quantity, subtract the index of the divisor from that of the dividend, and place the remainder over the common radical part or root.

If the radicals have co-efficients, the co-efficient of the dividend must be divided by that of the divisor.

If the quantities have the same radical sign or index, divide them as rational quantities, and place the quotient under the common radical sign.

EXAMPLES FOR PRACTICE.

1. Divide $2\sqrt[3]{4c}$ by $3\sqrt{ac}$.
2. Divide $10\sqrt[3]{108}$ by $5\sqrt[3]{4}$.
3. Divide $10\sqrt{27}$ by $2\sqrt{3}$.
4. Divide $8\sqrt{108}$ by $2\sqrt{6}$.
5. Divide $(a^2b^2d^3)^{\frac{1}{2}}$ by $d^{\frac{1}{2}}$.
6. Divide $(16a^3-12a^2x)^{\frac{1}{2}}$ by $2a$.
7. Divide $6\sqrt{138}$ by $2\sqrt{6}$.
8. Divide $5\sqrt[3]{512}$ by $4\sqrt[3]{2}$.
9. Divide $\frac{1}{2}\sqrt{5}$ by $\frac{1}{2}\sqrt{2}$.
10. Divide $\sqrt{7}$ by $\sqrt[3]{7}$.
11. Divide $6\sqrt{54}$ by $3\sqrt{2}$.
12. Divide $4\sqrt[3]{72}$ by $2\sqrt[3]{18}$.

INVOLUTION OF RADICAL QUANTITIES.

To involve a radical quantity to any required power.

Multiply the index of the root into the index of the power to which it is to be raised.

1. Thus the square of $a^{\frac{1}{3}}=a^{\frac{1}{3}\times 2}=a^{\frac{2}{3}}$. For $a^{\frac{1}{3}}\times a^{\frac{1}{3}}=a^{\frac{2}{3}}$.
2. Required the cube of $a^{\frac{1}{3}}$.
3. Required the nth power of $a^{\frac{1}{m}}$.
4. Required the fifth power of $a^{\frac{1}{3}}y^{\frac{1}{4}}$.
5. Required the cube of $a^{\frac{1}{n}}x^{\frac{1}{m}}$.
6. Required the square of $a^{\frac{2}{3}}x^{\frac{2}{5}}$.
7. Required the cube of $a^{\frac{1}{3}}$.
8. Required the nth power of $a^{\frac{1}{n}}$.

A root is raised to a power of the same name by removing the index or radical sign.

N.B. When the radical quantities have *rational co-efficients*, these must be involved by actual multiplication.

9. Thus the cube of $\sqrt[3]{b+x}$, is $b+x$.
10. And the nth power of $(a-y)^{\frac{1}{n}}$, is $a-y$.
11. The square of $a\sqrt[n]{x}$, is $a^2\sqrt[n]{x^2}$.
 For $a\sqrt[n]{x}\times a\sqrt[n]{x}=a^2\sqrt[n]{x^2}$.
12. Required the nth power of $a^mx^{\frac{1}{m}}$.
13. Required the square of $a\sqrt{x-y}$.
14. Required the cube of $3a\sqrt[4]{y}$.

But if the radical quantities are connected with others by the signs + and −, they must be involved by a multiplication of the several terms.

15. Required the square of $a+\sqrt{y}$ and of $a-\sqrt{y}$.

$a+\sqrt{y}$	$a-\sqrt{y}$
$a+\sqrt{y}$	$a-\sqrt{y}$
$a^2+a\sqrt{y}$	$a^2-a\sqrt{y}$
$a\sqrt{y}+y$	$-a\sqrt{y}+y$
$a^2+2a\sqrt{y}+y.$	$a^2-2a\sqrt{y}+y.$

16. Required the cube of $a-\sqrt{b}$.
17. Required the cube of $2d+\sqrt{x}$.
18. Required the 4th power of $\sqrt{d}$.
19. Required the 4th power of $-\sqrt{x-1}$.
20. Required the 6th power of $\sqrt{a+b}$.

EVOLUTION OF RADICAL QUANTITIES.

The operation for finding the *root* of a quantity which is *already a root*, is the same as in other cases of evolution. Hence we derive the following

RULE FOR THE EVOLUTION OF RADICALS.

Divide the fractional index of the quantity by the number expressing the root to be found. Or,

Place the radical sign belonging to the required root over the given quantity.

If the quantities have rational co-efficients, *the root of these must be extracted and placed before the radical sign or quantity.*

1. Thus the square root of $a^{\frac{1}{3}}$, is $a^{\frac{1}{3}\div 2}=a^{\frac{1}{6}}$.
2. Required the cube root of $a(xy)^{\frac{1}{2}}$.
3. Required the nth root of $a^6\sqrt{by}$.
4. Required the 4th root of $\sqrt{a}\times\sqrt[6]{b}$.
5. Required the 7th root of $128\sqrt[7]{d}$.

From the preceding rules it will be perceived that *powers* and *roots* may be brought promiscuously together, and subjected to the same modes of operation.

EXAMPLES FOR PRACTICE.

1. Find the 4th root of $81a^2$.
2. Find the 6th root of $(a+b)^{\frac{2}{3}}$.
3. Find the nth root of $(x-y)^{\frac{1}{2}}$.
4. Find the cube root of $-125a^3x^6$.
5. Find the square root of $\frac{4a^4}{9x^2y^2}$.
6. Find the 5th root of $\frac{32a^5x^{10}}{243}$.
7. Find the square root of $x^2-6bx+9b^2$.
8. Find the square root of $a^2+ay+\frac{y^2}{4}$.
9. Reduce ax^3 to the form of the 6th root.
10. Reduce $-3y$ to the form of the cube root.
11. Reduce n^2 and $a^{\frac{1}{2}}$ to a common index.
12. Reduce $4^{\frac{1}{3}}$ and $5^{\frac{1}{4}}$ to a common index.
13. Reduce $a^{\frac{1}{2}}$ and $b^{\frac{1}{4}}$ to the common index $\frac{1}{4}$.
14. Reduce $2^{\frac{1}{2}}$ and $4^{\frac{1}{3}}$ to the common index $\frac{1}{6}$.
15. Remove a factor from $\sqrt{294}$.
16. Remove a factor from $\sqrt{x^3-a^2x^2}$.
17. Find the sum and difference of $\sqrt{16a^2x}$ and $\sqrt{4a^2x}$.
18. Find the sum and difference of $\sqrt[3]{192}$ and $\sqrt[3]{24}$.
19. Multiply $7\sqrt[3]{18}$ into $5\sqrt[3]{4}$.
20. Multiply $4+2\sqrt{2}$ into $2-\sqrt{2}$.
21. Multiply $a(a+\sqrt{c})^{\frac{1}{2}}$ into $b(a-\sqrt{c})^{\frac{1}{2}}$.
22. Multiply $2(a+b)^{\frac{1}{m}}$ into $3(a+b)^{\frac{1}{m}}$.
23. Divide $6\sqrt{54}$ by $3\sqrt{2}$.
24. Divide $4\sqrt[3]{72}$ by $2\sqrt[3]{18}$.
25. Divide $\sqrt{7}$ by $\sqrt[3]{7}$.
26. Divide $8\sqrt[3]{512}$ by $4\sqrt[3]{2}$.
27. Find the cube of $17\sqrt{21}$.
28. Find the square of $5+\sqrt{2}$.
29. Find the 4th power of $\frac{1}{2}\sqrt{6}$.
30. Find the cube of $\sqrt{x}-\sqrt{b}$.

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FRENCH READINGS.—No. XXVI.

LA MARGUERITE ET L'EPI DE BLE'.

Section II.

Lorsque les deux enfants repassèrent le soir, la marguerite était fanée sur la tête de Marie,[1] qui n'y songeait[a] déjà plus et s'en revenait en faisant *l'école buissonnière*[b]....Louise, chargée d'une récolte d'herbe, éleva sa figure blonde au dessus de la haie,[2] et jeta un regard d'espoir à son épi florissant.

—Souviens-toi[c] de ces petites filles,[3] me dit mon père avec gravité. Je soupçonne qu'elles ressemblent l'une et l'autre, aux objets si différents de leurs vœux.

Puis il me fit l'histoire de la marguerite[4] et celle du froment.

Dans les champs et dans les jardins, la marguerite est la même; jolie, coquette et inutile. Celle qu'on nomme la *pâquerette*, s'établit dans l'herbe courte,[5] pour l'étoiler de son bouton d'or et de son blanc diadème. Celle qui prend le nom de *reine des prés*, se dresse et se balance[6] sur sa tige au dessus de tout ce lui l'environne. Mais quand la faux du moissonneur vient l'abattre, elle n'offre au sol[7] qu'une graine funeste et à la dent des bestiaux[d] qu'un fourrage détesté. Enfin, celle qui brille dans les parterres, n'a que son éclat d'un jour[e] et ne présente à l'homme ni parfum ni produit.

L'histoire du froment, au contraire, est l'histoire de la civilisation[9] même. Il naît[e] avec elle, il en développe et en suit[f] les progrès, et il ne meurt[g] que sous les latitudes où elle expire.[10] Ceci est la plus admirable harmonie de la nature.

Les jour suivants, Marie continua de faire appel[11] à ses marguerites, de s'en parer une heure et de les perdre à travers ses jeux.—Quand l'épi fut mûr, Louise vint le cueillir,[12] et l'emporta soigneusement. Ce jour-là, il y avait fête au village.[13] Marie passa les heures à danser,[14] sa marguerite aux cheveux. Louise, faisant sa moisson dans les règles,[15] égrena l'épi et en conserva la riche semence.

Dix années plus tard, malgré la recommandation de mon père,[16] j'avais oublié les deux sœurs. Il me rappela[h] leur histoire[17] et celle de la marguerite et de l'épi. Puis il me conduisit dans le village,[18] et me montra, à la fenêtre d'une chaumière encadrée de feuillage et de fleurs, une jeune fille[19] qui achevait sa toilette et dont les longs cheveux noirs étaient ornés d'un cercle de perles et d'une marguerite....

—C'est Marie! m'écrini-je ?[20]

—Oui, c'est Marie,[21] toujours vaine comme la première fleur que nous lui donnâmes. Elle a passé sa jeunesse oisive dans les fêtes; et elle attend un mari qui ne viendra jamais, car elle n'a d'autre dot que les marguerites desséchées de notre jardin.

De là, nous allâmes dans un champ de blé mûr,[22] et nous vîmes une autre jeune fille,[23] d'une beauté calme et grave, dont les vêtements annonçaient l'aisance, et qui, les mains posées sur un tronc d'arbre, contemplait[24] doucement la moisson dorée.

Je reconnus[i] Louise, et mon père me dit:

Cette moisson est à elle[25] et vient, sillon par sillon, année par année, du premier épi qu'elle a reçu de nous et qu'a multiplié[j] son travail. Elle n'a distrait[k] de ses produits, à chaque saison, que la part des pauvres,[26] multipliée aussi par sa charité; et elle obtiendra sa récompense après la récolte, en épousant le plus sage et le plus riche fermier du canton.

Une telle leçon ne vaut-elle[l] pas un petit coin de terre, et n'ai-je pas raison d'avoir un champ de blé dan mon jardin? Heureux si mes épis trouvaient autant de Louises[27] que mes marguerites rencontrent de Maries!... JARDINEUR.

Colloquial Exercise.

1. Où était la marguerite, lorsque les enfants repassèrent le soir?
2. Que fit Louise alors?
3. Que dit le père de l'auteur?
4. Que fit-il ensuite?
5. Où se trouve la pâquerette?
6. Que fait la reine des prés?
7. Qu'offre-t-elle après la moisson?
8. Et la marguerite des parterres?
9. Qu'est-ce que l'histoire du froment?
10. Que fait le froment?
11. Que continua de faire Marie, les jours suivants?
12. Que fit Louise quand l'épi de blé fut mûr?
13. Que se passait-il au village?
14. Où était alors Marie?
15. Que faisait Louise?
16. Qu'arriva-t-il dix années plus tard?
17. Que rappela à son fils, le père de l'auteur?
18. Où le conduisit-il?
19. Que lui montra-t-il?
20. Que dit le jeune homme?
21. Que répondit le père?
22. Où allèrent-ils de là?
23. Que virent-ils dans un champ de blé mûr?
24. Que faisait la jeune fille?
25. Que dit le père?
26. Qu'avait distrait de ses produits la jeune fille?
27. Par quel souhait finit le morceau?

Notes and References.—*a.* L. part ii., § 49, R. (1).—*b.* faire l'école buissonnière; this familliar expression may be rendered in English by: *to play the truant, to stay away from school.* —*c.* L.S. 36, R. 2—*d.* the singular of *bestiaux*, is *bétail.*—*e.* from *naître*; L. part ii., p. 96.—*f.* from *suivre*; L. part ii., p. 106.—*g.* from *mourir*; L. part ii., p. 96.—*h.* L. S. 36, R. 2.—*i.* from *reconnaître*; L. part ii, p. 102.—*j. travail* is the subject of the verb.—*k.* distrait, *taken.*—*l.* from *valoir*; L. part ii., p. 108.

LE CHIEN DU LOUVRE.

Section I.

PASSANT que[1] ton front se découvre![1]
Là plus d'un brave est endormi,[2]
Des fleurs pour le martyr du Louvre,[3]
Un peu de pain[4] pour son ami!

C'était le jour de la bataille;
Il[b] s'élança sous la mitraille;[5]
Le chien suivit.
Le plomb tous deux vint les[c] atteindre,[4]
Est-ce le maître qu'il faut plaindre?
Le chien survit.[d]

Marie, vers le brave il se penche[7]
L'appelle, et de sa tête blanche
Le caressant,
Sur le corps de son frère d'armes,
Laisse rouler ses grosses larmes[8]
Avec son sang.

Des morts voilà le char qui roule;
Le chien, respecté par la foule,
A pris son rang,[9]
L'œil abattu, l'oreille basse,[10]
En tête du convoi qui passe,
Comme un parent.[e]

Au bord de la fosse[11] avec peine,
Blessé de juillet,[f] il se traîne
Tout en boitant;
Et la gloire y jette son maître,
Sans le nommer,[12] sans le connaître:
Ils étaient tant![13]....

Gardien du tertre funéraire,[14]
Nul plaisir ne le peut distraire[15]
De son ennui;

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En fuyant la main qui l'attire[16]
Avec tristesse il semble dire:
Ce n'est pas lui![17]

Colloquial Exercise.

1. Que dit d'abord le poète au passant?
2. Pourquoi le passant doit-il se découvrir le front?
3. Que devra-t-il placer sur la tombe?
4. Que devra-t-il donner à l'ami du brave?
5. Qu'arriva-t-il le jour de la bataille?
6. Le maître et le chien furent-ils blessés?
7. Que fit le chien voyant son maître mort.
8. Que laissa-t-il couler sur le corps de son frère d'armes?
9. Le chien suivit-il le convoi de son maître?
10. Paraissait-il triste?
11. Où se traîna-t-il avec peine?
12. Comment la gloire y jeta-t-elle son maître?
13. Pourquoi ne le connaissait-on pas?
14. Que devint alors le fidèle animal?
15. Son chagrin paraissait-il se dissiper?
16. Etoit-il sensible aux caresses qu'on lui faisait?
17. Que semblait-il dire avec tristesse?

Notes and References.—a. que ton front se découvre, *let thy brow be bared! uncover thy brow.*—b. il, *the master of the dog.*—c. vint les atteindre, *struck them.*—d. from *survivre*; L. part ii., p. 108.—e. parent, *relation.*—f. juillet, *the revolution of July*, 1830.

ARABESQUES.

The graceful but heterogeneous species of ornament thus designated derived this modern name from the Spanish Arabs, those brilliant children of the East, who were so far in advance of all their Continental neighbours, both in literature and art, and whose dominion forms so stirring and romantic an episode in European history. But this style of decoration existed long before ever the turbaned warriors of the Prophet set foot in Spain. Specimens of it are met with in numerous remains of Grecian and Roman art at the present day, and there is abundant proof that its origin is still more remote. Vitruvius, with much probability, traces its invention to the earliest *praticians* of nearly all science and art, the Egyptians, and finds the first developments of the idea in the hieroglyphical monuments on the banks of the Nile. At the fall of the Roman empire, arabesque decorations shared in the almost universal neglect of the fine arts, and are hardly to be met with in any of the Christian buildings erected about that retrograde period. But when the enthusiastic and victorious followers of Mahomet came forth from their native deserts to conquer and proselytise the world, they opened up even the current of suspended civilisation, and cultivated the various branches of science and art with a vigour which the rude asceticism of their Christian contemporaries could neither feel nor practise. The dogmas of their religion, however, strictly forbade the representation of animals of any kind, in order to avoid the very semblance of idolatry; the adoption, therefore, of this species of decoration for their paintings and sculptures at once satisfied the restrictions of the Koran, and provided a field for the practice of the fine arts. Without violating any injunction of their religion, they could here embody the creations of their brilliant Eastern imaginations in every variety of graceful and fantastic combinations of fruit and flowers. With these they painted and sculptured the surface of their buildings. The grand mosque of Cordova and the Alhambra of Granada contain many specimens of these Arabic decorations, which even yet, after the lapse of centuries, have lost but little of their original exquisite brilliancy of colour or clearness of outline. In these two qualities they far surpass all other specimens of this branch of art which were executed by any of the other European nations who flourished at the same time. The arabesque compositions of Christian artists, however, in addition to vegetable forms, were made to include animals of every kind, whether real or imaginary; hence, in time, all fanciful combinations of natural objects, of whatever kind, which were employed for the continuous decoration of a flat surface, came to bear this designation. The name, indeed, has now become so general as to be applied to the strange enrichments found on the walls of Herculaneum and Pompeii, as well as to others of the same and earlier date, which were formed and forgotten long before the sons of Ishmael had learned to draw. The most celebrated arabesques of modern times are those with which the prince of painters ornamented the arcaded gallery of the Vatican, which bears his name. Though only one of the three sides of this gallery, or rather galleries—for it is in three lengths—exhibits the designs of the great artist himself, they are always distinguished as *Le Logge di Raffaelle.*

ANSWERS TO CORRESPONDENTS.

In compliance with the urgent request of several Correspondents, it is our intention to give a few Lessons in Spanish, commencing in our next Number, and to complete our Lessons in Arithmetic.

A Young Draughtsman.—It is always best to sketch from Nature. You may gain some facility in sketching by the copying of prints; but you will never attain to that freedom and certainty which is essential to the true artist. In reality, whatever may be urged to the contrary, it is no more difficult in practice to draw from Nature than it is to draw from engravings. The "round," as it is technically called, is, in our opinion, easier than "the flat." All that is required is steady, persevering practice. As to the comparative advantage of the two there can be no doubt. The man who can sketch from Nature can copy a picture or a print; but the man who is only trained to copy the print or picture, cannot sketch from Nature.

A Correspondent asks whether Herne's Oak still exists in Windsor Park. It does not now; but it was there as late as last summer. It had ceased to put out leaves for more than half a century; and its sapless trunk was hollowed out, by gradual decay, to the height of from ten to twelve feet from the ground. It fell on a quiet day in August last. All the solid timber that remained was, by Her Majesty's command, preserved, and various articles have since been made of it, as memorials of the venerable tree—venerable even three hundred years ago. The reference to Herne's Oak occurs in the comedy of "The Merry Wives of Windsor:"—

> "There is an old tale goes, that Herne the hunter,
> Sometime a keeper here in Windsor forest,
> Doth, all the winter time, at still midnight,
> Walk round about an oak, with great ragg'd horns;
> And there he blasts the tree."

A Young Reader.—The cuttle-fish certainly possesses some very extraordinary qualities. It is about two feet in length, and is covered with a very thin skin; its flesh is composed of a gelatinous substance, which, however, inside, is strengthened by strong bone, of which such great use is made by the goldsmith. It is possessed of eight arms, which it extends, and which are probably of service to it in fishing for its prey: while alive, it is capable of lengthening or contracting these at pleasure; but when dead, they contract and lose their rigidity. They feed upon small fish, which they seize with their arms; and they are bred from eggs, which are laid upon the weeds along the sea-shore. The cuttle-fish is found along many of the coasts of Europe; but they are not easily caught, from a contrivance with which they are furnished by Nature; this is a black substance, of the colour of ink, which is contained in a bladder generally on the left side of the belly, and which is ejected by the creature at will. Whenever, therefore, this fish is pursued, and when it finds a difficulty of escaping, it spurts forth a great quantity of this black liquor, by which the waters are totally darkened; and then it escapes, by lying close at the bottom. In this manner the creature finds its safety. The ink, under the name of "sepia," is used in painting. It is of a soft brown colour, when prepared. The ancients used it largely to dye stuffs with.

F. L. K.—Woody fibre appears to consist of elongated cells, generally spindle-shaped, which are so much longer than they are broad, that they appear like so many threads or fibres. These fibres, or elongated cells, are filled with a hard substance, by which they are fitted to give a firm and durable character to the vegetables in which they mostly abound. In the stems of herbs and in the softer parts of other plants, as their leaves and flowers, a few woody fibres may be found, giving support to the tubular vessels. In pine and fir trees, and others of a similar class, the woody fibres are beautifully marked or dotted at the sides, so that we can tell by the inspection of a very small piece of wood with a microscope, whether it belongs to that tribe.

John H.—Every sentence, however long, can only be composed of three kinds of combinations—the predicative, the attributive, and the objective: as "Henry wrote;" add an object to the predicate, "Henry wrote a letter;" add an idea attributively to both substantives, "The anxious Henry wrote a long letter;" add ideas objectively to both adjectives, "Henry, anxious to hear from him, wrote a very long letter;" add an idea objectively to the verb, "Henry, anxious to hear from him immediately, wrote a very long letter." Throughout, it will be observed, the parts are kept up—the predicative, attributive, and objective.

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ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LVI.

(*Continued from page* 36.)

TERRESTRIAL MAGNETISM—THE COMPASS.

Inclination or Dip; Magnetic Equator.—From the fact that the compass effects the direction towards the north, it might be supposed that the force which acts upon it comes from a point in the horizon; but this is not the case, for if we arrange the needle in such a manner that it can move freely in a vertical plane about a horizontal axis, we shall find that though the centre of gravity of the needle exactly coincides with the axis of suspension, its south pole inclines constantly to the north pole of the earth in this quarter of the globe. In the southern hemisphere, on the contrary, it is the north pole of the needle which inclines towards the south pole of the earth.

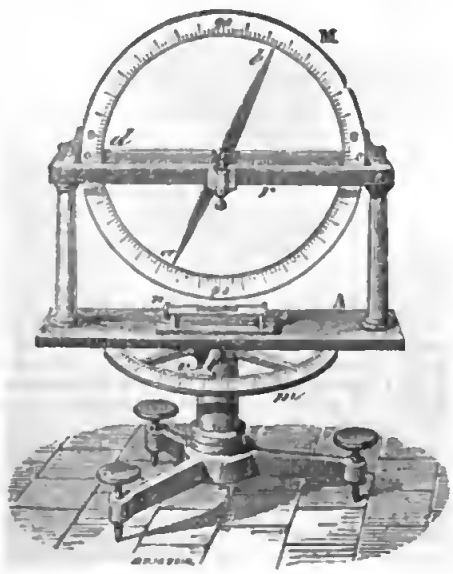
When the vertical plane in which the needle moves coincides with the magnetic meridian, the angle it makes with the horizon is called the *inclination* or *dip*. In any other plane than the magnetic meridian, the dip increases, and is ninety degrees in a plane perpendicular to the magnetic meridian. In fact, the magnetic force of the earth being then resolved into two forces, the one vertical and the other horizontal, the former gives the needle its vertical position, while the latter, acting in the direction of the axis of suspension, cannot turn the needle.

The inclination, like the declination, varies with the latitude, but according to a more fixed law. Near the north pole it is nearly ninety degrees, and proceeding thence towards the equator, it diminishes till it becomes nothing at the equator. In the southern hemisphere the inclination reappears, but in a contrary direction, that is to say, it is the north pole of the needle which sinks below the horizon.

The curve which passes through all the points at which the inclination is nothing is called *the magnetic equator*, and the points at which it is 90° are called *magnetic poles*. According to the observations of M. Duperrey, the magnetic equator appears to intersect the terrestrial equator in two diametrically opposite points, one in the Pacific and the other in the Atlantic Ocean. The inclination varies at the same place from one period to another.

The Inclination Compass is the name given to an instrument used for measuring the magnetic inclination. This compass, which is made entirely of copper, is composed first of a horizontal circle *m*, graduated, and supported by three screws, fig. 370. Above this circle is a plate A, moveable about a vertical

Fig. 370.



axis, and supporting by means of two columns a second graduated circle M, which measures the inclination. A frame *r* supports the needle *a b*, and a level *n* serves by means of the three screws to give a horizontal position to the diameter passing through the two zeros of the circle M.

To observe the inclination, we begin by determining the magnetic meridian, which is done by turning the plate A upon the circle *m* till the needle becomes vertical, which takes place when the needle is in a plane perpendicular to the magnetic meridian. Then turning the plate A through 90 degrees on the circle *m*, we bring the vertical circle M to the magnetic meridian. The angle *d c a* which the magnetised needle then makes with the horizontal diameter, is the angle of inclination. But there are two causes of error which must be taken into account. First, the magnetic axis of the needle may perhaps not coincide with the axis of the needle itself, whence arises an error which is corrected by the method of turning already described. Secondly, the centre of gravity of the needle may possibly not coincide with the axis of suspension, and then the angle *d c a* is too small or too large, according as the centre of gravity is above or below the centre of suspension, for in the first case the action of gravitation is contrary to that of terrestrial magnetism in turning the needle, while in the second it is in the same direction. This error is corrected by reversing the poles of the needle, which is accomplished by rubbing it with the contrary poles of two bars in such a manner, that each pole of the magnet is rubbed by a pole of the same name as its own. The direction of the needle being then changed, if its centre of gravity was before above the point of suspension, it is now below, and the angle of inclination which was before too small is now too large. The true value is found by taking the mean between the two.

Astatic Needle and System.—A needle withdrawn from the magnetic action of the earth is said to be *astatic*. This is the case with a needle moveable about an axis in the plane of the magnetic meridian in a direction parallel to the inclination. An *astatic system* is the combination of two needles of the same power placed parallel, with their contrary poles opposite each other, as seen in fig. 371. If the two needles are of exactly

Fig. 371.



the same power, the contrary action of the earth upon the poles *a'* and *b*, as well as on *a* and *b'*, is self-destructive, and the system is completely *astatic*.

MAGNETISATION AND LAWS OF MAGNETIC ACTION.

Sources of Magnetisation.—The various sources of magnetisation are the influence of powerful magnets, terrestrial magnetism, and electricity. There are three methods of magnetising by magnets, simple touch, separate touch, and double touch. Whichever of these methods be employed, there is a limit to the degree of acquired magnetic power, depending upon the temper and intensity of the magnets employed. When this limit is attained, the bar is said to be magnetised to saturation. When it has been passed, the bar soon returns to it, and even tends to sink below it, if the magnetic power is not retained by means of a process to be described presently.

Method of Simple Touch.—This consists in sliding the pole of a powerful magnet from one end of the bar we wish to magnetise to the other, and repeating the operation several times, but always in the same direction. This process is incapable of producing any great effect, and consequently is only applicable to small bars. It has the further inconvenience of frequently developing consequent points.

Method of Separate Touch.—This was adopted by Knight in this country in 1745, and consists in placing the two contrary poles of two bars of equal intensity at the middle of the bar we wish to magnetise, and making them both slide simultaneously towards one of the ends of the bar, holding them vertically. Each magnet is then brought back to the middle of the bar, and the operation is repeated several times on both sides till the bar is magnetised. Duhamel improved this method by placing the two ends of the bar to be magnetised at the contrary poles of two fixed magnets, whose action combines with that of the moveable magnets, the relative position of the poles being the same as in fig. 372. This process gives the most steady magnetic power.

Method of Double Touch.—In this method, introduced by Mitchell, the two magnets employed in friction are still placed at the middle of the bar we wish to magnetise, with their contrary poles towards each other; but instead of sliding towards its extremities in contrary directions, they are kept at a certain distance from each other by a small piece of wood placed between them, and slide together from the middle to one extremity, then from this to the other extremity, and so on in such a manner that each half of the bar undergoes the same number of these operations. It is to be observed that in the various processes of magnetisation the magnets lose none of their power, which proves that the magnetic fluids do not pass from one bar to another.

Magnetisation by the Action of the Earth.—The action of the earth upon magnetic substances being similar to that of magnets, terrestrial magnetism constantly tends to separate the two fluids which are in a neutral state in soft iron and steel. But in the latter substance, the coercive force being very great, the action of the earth is insufficient to produce magnetisation. It is not so with a bar of soft iron, especially if it is placed in the magnetic meridian parallel to the inclination. Yet even this is only an unsteady sort of magnetisation.

Magnetic Bundles. Armatures of Magnets.—A magnetic bundle is a collection of magnetised bars united parallel to each other at their poles of the same name. Sometimes it is made in the shape of a horse-shoe (fig. 373), sometimes of a straight line (fig. 374). The bundle represented in fig. 373 is formed of five plates of steel placed side by side, that in fig. 374 consists of twelve plates arranged in three layers with four plates in each. The form of the horse-shoe is preferable

Fig. 373.

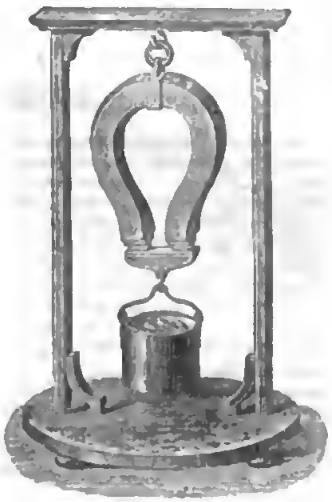
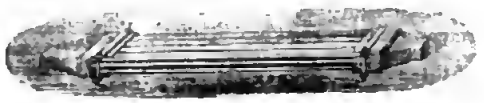


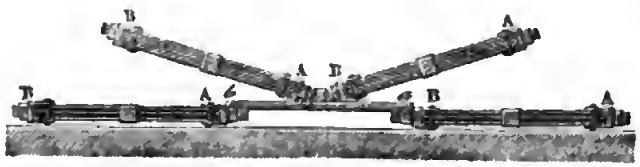
Fig. 374.



for supporting a weight by means of the magnet, because use is made of both poles at the same time. The magnetic power of a bundle is not equal to the sum of the separate forces of the bars, owing to the repulsive action of neighbouring poles upon one another.

Armatures or *Keepers* of magnets, are the pieces of soft iron which are placed in contact with the poles, to preserve or increase the magnetic power. Fig. 375 represents a natural magnet with its armatures. On the surfaces corresponding to the poles are two plates of soft iron, each terminated by a massive block. Under the influence of the natural magnet these plates become magnetised, and the letters A and B representing the position of the poles of the natural magnet, it is easy to see that those of the armatures are respectively represented by *a b*. Now these armatures, when once they are

Fig. 372.



magnetised, react in their turn upon the neutral fluid of the natural magnet, decompose it, and thus increase the magnetic power. Without armatures, natural magnets are very feeble, but with them they become capable of sustaining weights which

Fig. 375.



go on increasing till they have reached a certain limit that is never passed. The substance supported *a' b'*, which is of soft iron, acts as a second armature, for being magnetised by induction, its poles *a'* and *b'* react upon the poles *a* and *b* of the former. To furnish artificial magnets with armatures, place them in pairs, as represented in fig. 376, with the contrary poles opposite each other; then put two small bars of soft iron A B in connexion with the poles, these becoming magnetised by induction, their poles react upon the magnetised bars and preserve their intensity. As for moveable needles (figs. 362 and 365) as they turn towards the magnetic poles of the globe, the influence of this latter acts as an armature.

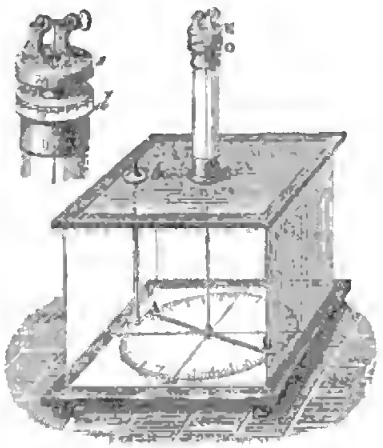
Law of Magnetic Attraction and Repulsion.—Coulomb was the first who established the law, that magnetic attraction and repulsion is inversely as the square of the distance, a principle which he established by two methods, that of the torsion balance and that of oscillations.

Fig. 376.



Torsion Balance.—This apparatus consists of a glass box (fig. 377), with a glass cover capable of being removed at pleasure, and having an opening near the edge to admit a magnet *a b*. In the centre of this cover is a second opening, into which a glass tube is fitted so as to turn with slight friction against the edges of the orifice. This tube has in the upper part of it a micrometer, or combination of two pieces, one of which D is fixed and divided round its edge into 360 degrees, and the other B which is moveable, has graduations marked on it, to show the number of degrees through which it is turned on the dial-plate D. On the left of the figure at *c* and *d* the two pieces which constitute the micrometer are represented on a large scale. To the disc *c* are affixed two uprights, through which passes a horizontal axis. Upon this axis a very fine silver thread is wound, supporting a magnetised

Fig. 377.



needle A B. Lastly, at the bottom of the box is a dial-plate with divisions to measure the displacement of the needle A B and consequently the torsion of the silver thread, or the force with which it returns to a state of rest.

The index *a* of the disc *c* being at zero on the dial *d*, the box is placed in such a manner that the centre and the zero of the lower dial-plate may be in the magnetic meridian. Then, taking the needle A B away, replace it by a similar needle made of copper or any other non-magnetic metal. Turn the glass tube, and with it the pieces B and D in such a way that this needle may stop at the zero point of the lower dial-plate. The magnetised needle not being yet inserted, remove the non-magnetic needle, and put the magnetised needle A B in its place, which will then be exactly in the magnetic meridian, and the torsion of the silver thread is null.

The apparatus being thus arranged, it is necessary before introducing the magnet *a b* to know the action of the earth upon the moveable needle A B when it is a certain number of degrees out of the magnetic meridian. For this purpose, turn the piece B till the needle A B is moved one degree in the same direction. The number of degrees minus one, through which the micrometer has been turned, represents the total torsion of the thread.

In the experiments made by Coulomb, this number was 35, but it varies with the length of the thread, its diameter, and the intensity of the bar A B. Now the needle remaining at present in equilibrium, it is evident that the force of the torsion of the thread is precisely equal and opposite to the directing influence of the earth. This action, then, in the experiments of Coulomb was represented by 35 for a deviation of one degree; but the force of torsion being proportional to the angle of torsion (vol. iv. p. 101), and the directing action of the earth, when there has once been equilibrium, being equal to it; it follows that this latter force, for the deviation of 2°, 3°, etc., is represented by twice, three times, etc. 35 degrees.

The action of the earth being determined, put the magnet *a b* into the box, taking care to put poles of the same name opposite each other. The pole of A of the needle is then repelled, and if N represent the number of degrees which measure the angle of deviation when the needle A B is in equilibrium, this needle tends to return to the magnetic meridian with a force represented by $N + 35\,N$, the part N being due to the torsion of the thread, and the other part $35\,N$ to the action of the earth. But since it does not return to the magnetic meridian, the repulsive force exercised between the poles *a* and *A* must be itself equal to $N + 35\,N$. Now turn the disc B in such a way that the angle of deviation N may become half what it was. According to the position of the needle A B in the accompanying figure, it would be necessary to turn it from right to left. Representing the displacement of the disc B by *n*, we see that the suspension thread is twisted *n* degrees to the left at its upper end, and $\frac{N}{2}$ degrees to the right at its lower end, consequently its whole torsion is $n + \frac{N}{2}$. Therefore the real force which tends to bring back the needle to the magnetic meridian is $\left(n + \frac{N}{2}\right) \frac{35\,N}{2}$, $n + \frac{N}{2}$ representing the force of torsion, and $\frac{35\,N}{2}$ the action of the earth. Now, as the needle does not return to the meridian, the repulsive force between the two poles *a* and *A* must itself be represented by $n + \frac{N}{2} + \frac{35\,N}{2}$.

Substituting for *n* and *N* the numbers supplied by experiment, we find that the quantity $n + \frac{N}{2} + \frac{35\,N}{2}$ is precisely the quadruple of the quantity $N + 35\,N$ obtained by the first experiment. Therefore the law of Coulomb is demonstrated, for experiments are made with arcs, N and $\frac{N}{2}$, so small as to be nearly equal to their chords, that is to say, that when the arc is bisected, a A, the distance between the two poles is also apparently bisected.

Method of Oscillations.—This consists in making a magnetised needle oscillate in equal times, first under the sole influence of the earth, and then under the combined influence of the earth and the attracting pole of a magnet placed at two unequal distances one after the other. From the three numbers of oscillations observed, the law of Coulomb may be deduced by calculation.

Measure of Terrestrial Magnetism.—A great number of philosophers and navigators have employed themselves in measuring the magnetic intensity of the earth in different places and at different periods. Several methods have been adopted, which consist in making a needle of inclination or declination oscillate for a given time, and then deducing the relative intensities from the number of oscillations. Their observations have led to the establishment of the following laws.

1. The intensity of the earth's magnetism increases as we recede from the equator, and it appears to be half as great

again at the poles as at the equatorial line; consequently, the line without inclination is also that of the least intensity.

2. The magnetic intensity of the earth decreases as we rise in the atmosphere, and this decrease is probably according to the law that the force is inversely as the square of the distance.

3. The magnetic intensity of the earth varies with the hour of the day, being least between 10 and 11 in the morning, and greatest between 4 and 5 in the afternoon.

4. The magnetic intensity exhibits irregular variations, and, like the inclination and declination, is subject to perturbations from the influence of the aurora borealis.

LESSONS IN MORAL SCIENCE.—No. IV.

MORAL AGENCY, AND WHAT IS NECESSARY TO IT.

As actions of moral agents are the proper and only objects of moral approbation or disapprobation, it becomes necessary to institute an inquiry into the nature of moral agency: or into what are the constituents of a moral agent. The decision of this question must depend entirely on experience, and can never be determined by reasoning on abstract principles. The process is simply this: we contemplate a great variety of acts, which by the moral faculty we judge to possess a moral character. We next examine the circumstances in which those acts were performed, and we conclude those things which are found in all of them to be necessary to moral agency. Or, to render the examination more simple, we may suppose some one condition of the action to be absent, and then another, and then viewing the action as thus changed in its circumstances, we may bring it before the mind, and if the moral quality of the act appear unchanged, we conclude that that which has been removed from it is no essential circumstance in moral agency. But if the change in the circumstances of the action leads all men to take an entirely different view of its nature, then we conclude that this circumstance is essential to moral agency. To illustrate this principle, let us suppose the following case: If we see a man suddenly, without any apparent provocation, raise his hand and strike another, believing that it was freely done, by a man *compos mentis*, we feel a strong disapprobation of the act, as immoral and deserving punishment. But if on inquiry it is ascertained that the person who committed the assault was utterly destitute of reason, we may blame his keepers or friends who left him at liberty, but we no longer feel any moral disapprobation of the act. For it is the intuitive judgment of all persons, that a man destitute of reason is not a moral agent, nor accountable for his actions, whatever evil may be produced. We consider such a man as exactly in the same predicament as a wild beast which does an injury. This is the common judgment of men; for in all courts of justice, when a man is arraigned for an assault, if it can be proved that he was a maniac at the time, he is acquitted, and all men approve the judicial decision which exempts him from punishment. Hence it is apparent that the exercise of reason is essential to moral agency. We may bring before our minds a thousand acts, under different circumstances, but all performed by agents without reason, and no man can believe that such actions are of a moral nature, or of good or evil desert.

It may seem to be an objection to this broad assertion that there are some who entertain the opinion that infants are moral agents from their birth, and commit actual sin. But these persons do not suppose that an irrational being can be a moral agent, but they think that infants have an obscure exercise of reason. Their mistake is not in the general principle which has been laid down, but in the fact that infants have reason in exercise.

Again, let the case supposed be varied. Let it be that the person committing the assault had the full exercise of reason, but that the stroke was not voluntary, but the effect of a spasmodic, diseased, action of the muscles; or that the hand was moved by another. Every one, at once, judges that the person giving the stroke, whatever he might be in other matters, was no moral agent in this assault. It was a mere physical operation, and not proceeding from the will, could not be a moral act. Here we have a second circumstance or characteristic essential to moral agency, namely, that the action be voluntary. No involuntary action can be of a moral nature.

Some distinguish the liberty of the agent from voluntariness, but to us they appear to be the same, or to involve one another. If an act is voluntary, it is free; and if free, it must be voluntary. The highest conceivable degree of liberty in a dependent being is the power of doing as he wills or pleases. But as this subject has by metaphysical controversy been involved in perplexity, something may be said hereafter respecting what is called the freedom of the will.

When it is said that the actions of moral agents are the only proper objects of moral approbation or disapprobation, two qualifications of the assertion must be taken into view. The first is, that the omission to act when duty calls is as much an object of disapprobation as a wicked action. Should we see a number of persons sailing on a river in a boat, and while we surveyed them, should a child near them fall into the river, and no hand be stretched out to rescue it from drowning, we could not help feeling a strong disapprobation of the conduct of the persons who were near enough to render the necessary help. If, however, it should be ascertained that one or more of the persons were fast bound and pinioned, so that they could not possibly stretch out their hands to rescue the child, we should exempt them from all blame; for no man is bound to do what is physically impossible. The second qualification of the statement is, that when we disapprove an external act, we always refer the blame to the motive or intention. But if we have evidence that the agent possesses a nature or disposition which will lead him often or uniformly to perpetrate the same act when the occasion shall occur, we not only censure the motive, but extend our moral disapprobation to the disposition or evil nature lying behind.

If we suppose the case of an agent acted on by a superior power, so that the nature and direction of the act depend not upon the agent himself, but upon the power by which he is governed, we shall consider the immediate agent as not free, and the acts brought forth as not properly his acts, but those of the governing power. A demoniac or person possessed by an evil spirit who had power to direct his thoughts and govern his actions, would not be an accountable agent.

There are some who maintain that all human actions proceed from God, as their first cause, and that man can act only as he is acted upon. Upon this theory, it does not appear how man can be an accountable moral agent; for though his actions may be voluntary and performed in the exercise of reason, yet, as he does not originate them, they can scarcely be considered his own.

We will now suppose the case of a man possessing reason, freedom, and will, and originating his own actions, but destitute of a moral faculty, or unable to perceive a difference between right and wrong. Can such a person be considered a moral agent? We think not. That being—how much soever of reason he may possess—who has no perception of moral relations, and no feeling of moral obligation, would be incapable of a moral law, or of performing moral acts. But the case is an imaginary one. There are, I believe, none who possess reason, and yet are destitute of all moral sense; but though we conceive of the intellect of a dog or an elephant increased to any degree, yet, as being destitute of a moral faculty, we do not regard them as moral agents.

MAN A MORAL AGENT.

Very few have entertained the opinion that man is a mere machine, governed by physical influences. It will not be necessary, therefore, to occupy time in refuting an opinion contrary to reason and universal experience.

But there are many who entertain the opinion that man is the creature of necessity; that in the circumstances in which each man is placed, he could not be different from what he is. This theory of fatalism is plausible, because a slight observation of the history of man shows that the moral characters of most men are formed by the education which they receive, and by the sentiments and conduct of those with whom they associate. It has, therefore, been maintained—and the opinion has in our day been industriously propagated—that man is not

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a free and accountable agent; that he is what he is, by the operation of causes over which he has no control; that no man should be censured or punished for his conduct, since those who censure him, if placed in the same circumstances, would act in the same manner. In short, that no man is responsible for his conduct; because his actions—whether good or bad—are the effect of necessary causes. It is held by the same persons that the only possible method of ameliorating the condition of the human race, is to educate them in such a manner as to avoid those prejudices which have hitherto proved inimical to the happiness of men; and to remodel society, rejecting those institutions which are supposed to cause most of the misery which is found in the world. This theory has not only been embraced with confidence, but attempts have been made to carry it out in practice. Societies, founded on the principles above stated, have been formed both in Great Britain and America. But thus far the experiment has been attended with small success. Still the advocates of the *Social system*, as it is called, have not been discouraged. They are instituting new societies upon an improved plan, and the most sanguine hopes are entertained by those concerned in these new associations, that a far better and happier state of society than any hitherto enjoyed is practicable and will be realised.

In answer to all arguments brought to prove that man is not a free moral agent, we appeal to the consciousness of every rational being. No arguments, however plausible, are of any force against intuitive first principles. Whether we can or cannot answer arguments against liberty, we know that we are free. In regard to some actions, we feel that we are under a moral obligation to perform them, and in regard to others, that we ought not to perform them, and if we are induced to violate this obligation, we feel that we are to be blamed, and are deserving of punishment.

Some philosophers have been persuaded by their reasonings that man is not free, but under necessity in all his actions. But as they could not deny that every man is intimately conscious of being free, they have adopted the opinion that man's feeling of liberty is a deceptive feeling, and contrary to fact. A far more reasonable conclusion is, that there must be some error in the reasoning from which the conclusion that man is not a free agent is deduced. When a chain of reasoning brings us to conclusions repugnant to our intuitive convictions, it is certain that there is a flaw in some link of it, whether we can discover it or not. We are as certain that we are free, as we can be; a revelation from heaven could not render us more so. As in other instances where speculative men have been led to adopt conclusions at variance with self-evident principles, so here, men act, in common life, in conformity with the common notions of mankind. They can by no effort divest themselves of this assent to certain fundamental truths.

MAN NOT UNDER A FATAL NECESSITY.

Although our consciousness of freedom ought to satisfy us, whatever reasonings to the contrary may be adduced; yet it may be useful to inquire whether, indeed, there are any arguments of force against the free agency of man. It is certain that one truth cannot be in opposition to any other truth. If, therefore, the deductions of reason and the evident principles of common sense and experience seem to stand in opposition to one another, it must arise from some misapprehension, or abuse of terms. As our understanding is given us to enable us to apprehend truth, no proposition clearly perceived to be true, whether intuitively or by ratiocination, can possibly be opposed to any other truth.

It becomes necessary, therefore, in the first place, to have distinct ideas of what is meant by liberty, and what by necessity. Here the reference must be, not to metaphysical reasoning, but to the common judgment and clear conviction of all impartial men. It has already been stated that that liberty which is necessary to moral agency, can be nothing else than the liberty of doing what we will, to the extent of our power. It is freedom of action in conformity with our desire and will. When a man is compelled by force to strike another (we mean not by the force of strong motives, but by actual physical force), we say he is not accountable, because not free to do as he willed. When we think of that liberty which is necessary to free agency, and to the performance of a moral act, this is the kind of liberty which we have in our minds. In judging of the moral quality of an act, we never attempt to go further back than the spontaneous inclination of the mind, and never think it necessary to know in what way this disposition was acquired. If the action proceed from will, so far as liberty is concerned it is a moral act. We cannot conceive of any greater or more desirable liberty than this. Dependent creatures, indeed, cannot possess that independent liberty which is the prerogative of the Deity. The creature, notwithstanding his liberty, is still under the government of divine Providence.

It is also important that we entertain distinct and accurate ideas of that necessity which is inconsistent with free agency. There is what has been termed moral or philosophical necessity, which is not incompatible with human liberty. This is no other than the certain operation of moral causes, producing moral effects, according to the power which they possess. Such necessity, it has been shown, must belong to God, because he cannot act in opposition to truth, wisdom, and justice. But this does not hinder him from acting freely. So the angels in heaven and glorified saints are so confirmed in holiness that they cannot sin; but still in loving and serving God they act most freely.

But as in the common use of terms, and according to the common apprehension of men, liberty and necessity are diametrically opposite; when the name necessity is applied to any exercise, the prejudice immediately arises that it cannot be free; especially if there be some points in which it coincides with real necessity. Here, it is probable, we have the true source of the difficulty and perplexity in which this subject has been involved. The word necessary should never have been applied to any exercises which are spontaneous or voluntary, because all such are free in their very nature. When we apply this term to them, although we may qualify it by calling it a moral or philosophical necessity, still the idea naturally and insensibly arises, that if necessary they cannot be free. It is highly important not to use a term out of its proper signification; especially when such consequences may arise from an ambiguous use. An event may be absolutely certain without being necessary. It was absolutely certain that God, in creating the world, would act most wisely. It is a matter of absolute certainty that the holy angels will continue to love and serve God incessantly; but this certainty is not inconsistent with liberty. If a man possess good principles, and all temptation to do wrong be removed, it is morally certain that, in any given case, he will do right; and if a man be of corrupt principles, and all virtuous considerations be foreign from his thoughts, and strong temptations be presented to his ruling passion, it is certain that he will yield to temptation and commit sin. But in all these cases there is no necessity, because there is no coercion or compulsion. If the mere certainty of an event were inconsistent with freedom, then there could be no such thing as liberty in God or the creatures. As God knows all things most certainly, every thing, in his view, whatever may be its cause, is equally certain; the divine prescience cannot be mistaken. There is no good reason why uncertainty should be considered essential to that liberty which is necessary to moral actions. All causes operate according to their nature and force. The reason why one effect is necessary and another free is, not that the one takes place without an adequate cause, or that the same cause may produce different effects; for both these are contrary to common sense. The true reason is, that the one is produced against will, or without will, whereas the other is a voluntary act.

Let the distinction between what is certain and what is necessary be fully comprehended and attended to, and a great part of the darkness which, in the view of many, has obscured this subject will be dissipated. Although, then, it should be demonstrated that the will is as certainly governed by motives as the scale of the balance is by weights, yet there can be no legitimate inference from the one to the other, as if that would prove that the will is not free but under a necessity. The difference lies, not in the difference of certainty in the two cases, but in the difference in the nature of the causes of that certainty.

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LESSONS IN FRENCH PRONUNCIATION.

No. IV.

CONSONANTS.

As a general rule, none of the Consonants when FINAL, have a distinct and independent sound, unless immediately followed by a word commencing with a vowel or H mute; in which case, the Consonant is joined with the next following word in pronunciation.

48. B b.

In any position within a word, this letter has the sound of the English letter B.

When doubled within a word, only one B is sounded, viz.:—

French.	Pronunciation.	English.
Abbesse	A-bess	*Abbess.*
Rabbi	Ra-bee	*Rabbi.*
Sabbat	Sa-bah	*Sabbath.*

At the end of Proper Names, B is always sounded.

In these two words, viz.: A-PLOMB, and PLOMB, the B is silent, and the next two preceding letters in each word, viz.: OM, take the Nasal sound of ON.

49. C c.

This letter has two entirely distinct sounds, viz.:—HARD and SOFT. Before the vowels A, O, U, and Œ, and also before the Consonants C, L, N, and R it has the hard sound of the letter K in the English word KILL, viz.:—

French.	Pronunciation.	English.
Calamité	Ka-la-me-tay	*Calamity.*
Comité	Ko-me-tay	*Committee.*
Cube	Kube	*Cube.*
Cœur	Kuh l rr	*Heart.*
Succès	Suk-sai	*Success.*
Classe	Klahss	*Class.*
Cniqua	Kneek	*Horse-thistle.*
Crédit	Kray-de	*Credit.*

But before E, I and Y, and also with a Cedilla before A, O and U, it has the soft sound of the letter S in the English word SEA, viz.:—

French.	Pronunciation.	English.
Cèdre	Saidr'	*Cedar.*
Cinq	Sanh i k	*Five.*
Cycle	Seekl'	*Cycle.*
Façade	Fa-sad	*Front.*
Façon	Fa-souh !	*Fashion.*
Reçu	R'su	*Receipt.*

When FINAL, and *not preceded by the letter* N, C is generally sounded like the letter K in the English word BOOK, viz.:—

French.	Pronunciation.	English.
Avec	A-vak	*With.*
Bec	Baik	*Beak.*
Caduc	Ka-duk	*Declining.*
Echec	Ay-shek	*Check.*

In a few words, however, C final is not sounded; and these exceptions are best found out by consulting a French dictionary. In a few words, C has the sound of the letter G in the English word GO, viz.:—SECOND: SECONDAIRE: SECONDAIREMENT: SECONDE: SECONDEMENT: SECONDES: SECONDINE.

In these words, the C, which commences the second syllable, has the sound of G, viz.: SECOND—as if printed SEGOND: pronounced S'-gonh! etc. We do not illustrate all the sounds of these French words *here*, because of the Nasal sounds contained in them

50. D d.

This letter, generally, has the sound of the letter D in the English word DEED. It is usually silent when *final*, except in Proper Names.

The principal exception to the above Rule is, when D is final just before a noun which commences with a vowel or an H mute. In such a case, the D has the sound of the letter T in the English word TOP; and in pronunciation is joined with the following word, as if it were its first letter, as will be seen in the two examples which follow, viz.:—

UN GRAND ACTEUR,	as if printed	UN GRANT ACTEUR.
UN GRAND HOMME,	„	UN GRANT HOMME.

In another instance, D has also the sound of T, viz.: at the end of the third person singular of the Indicative mood of Verbs, when followed by the Pronouns IL, ELLE or ON. In these cases, the D has the sound of the English T, and is joined to the following word in pronunciation, as if it were that word's first letter, viz.:—

ENTEND-IL ?	as if printed	ENTENT-IL ?
COUD-ELLE BIEN ?	„	COUT-ELLE BIEN ?
VEND-IL ?	„	VENT IL ?
RE'POND-ON AINSI ?	„	REPONT-ON AINSI ?

51. F f.

In the *commencement* and *body* of words, this letter is usually pronounced as the letter F in the English word FOR. It is sometimes sounded also in the *end of words*. There are several exceptions, however, which are best found in the French dictionary. In the French word NEUF, which means *Nine*, the F is silent when it precedes a word commencing with a Consonant, viz.: NEUF LIS—*nine lilies*, is pronounced as if printed—NEU LIS.

But the striking peculiarity of this letter consists in the fact, that it receives the sound of the letter V in the English word VOW, before another word commencing with a Vowel or H mute; and is joined with this word in pronunciation, as if it were its first letter, viz.:—

French.	Pronunciation.	English.
Neuf animaux	Neuv vanimaux	*Nine animals.*
Neuf enfans	Neuv venfans	*Nine children.*
Neuf hommes	Neuv vommes	*Nine men.*

52. G g.

Before the vowels A, O and U, and the Consonants D, H, L, M and R in the commencement of French words, G has the hard sound of the letter G in the English word GOT, viz.:—

French.	Pronunciation.	English.
Gâteau	Gah-to	*A Cake.*
Gosier	Go-zeay	*Throat.*
Aigu	Ay-gu	*Acute.*
Magdebourg	Mag-d'boor	*Magdeburg.*
Globe	Glob	*Globe.*
Augment	Og-manh i	*Increase.*
Grappe	Grap	*Cluster.*

G, final of the word BOURG, a market-place, takes the sound of the English K. This word is pronounced BOORK. Names of Towns ending in BOURG drop the final G; i. e. the G is silent, viz.:—

AUGSBOURG	pronounced	OGZ-BOOR.
COBOURG	„	KO-BOOR, etc., etc.

In the following French words, the initial G has the sound of the letter K in the English word KEEL, viz.:—

Gangrène	as if printed	Kangrène
Gangrener	„	Kangrener
Gangrené	„	Kangrené
Gangreneu	„	Kangreneu
Gangreneux	„	Kangreneux

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No rule can be given for this peculiarity in pronunciation, except the RULE OF CUSTOM. It is believed the above five words are the only ones in the French Language, concerning which this peculiar pronunciation obtains.

Before the vowels E, I and Y, the letter G has the soft sound of the letters ZH, viz. :—

French.	Pronunciation.	English.
Âgé	Ah-zhay	*Aged.*
Congé	Kenh'zhay	*Holiday.*
Gilet	Zhe-lay	*Waistcoat.*
Gigot	Zhe-go	*Leg of mutton.*
Gymnase	Zheem-naha	*Gymnasium.*

G *final*, before a Vowel or an H mute, takes the sound of English K, and is connected with the following word in pronunciation, as if it belonged to that word, viz. :—

RANG HONORABLE	as if printed	RANK HONORABLE.
SANG ET EAU	"	SANK ET EAU.
SANG HUMAIN	"	SANK HUMAIN.

G *final*, before a word commencing with a Consonant or an aspirated H, is in most French words silent, viz. :—

RANG NOBLE is pronounced RANH NOBL'.

Double G has the sound of only a single G, except before the vowels E and I; in which case, the first G is hard like G in the English word GO, and the second G has a soft sound represented by the two letters ZH, viz. :—

SUGGE'RER is pronounced SU-SHAY-RAY, etc. etc.

53. H.

This letter is used in the French language in two ways, usually styled MUTE and ASPIRATE—a definition perfectly intelligible to natives of France, but not equally so to others, that is, to foreigners. Let us explain. When we say H is MUTE, every one knows what is meant. But when we say H is ASPIRATE in the French language, *we do not mean* that it ever has the same sound as H in the English words HAVE, HIGH, HOLD and HULL, that is, *a forcible breathing*, or emission of the voice at the commencement of a word. There seems to be a misapprehension of this matter with many writers and teachers, not natives of France. It is believed that the true theory is this, viz., the French NEVER SOUND THE H. It is with them, virtually, ALWAYS MUTE. But besides being mute it has a particular duty to do—so to speak. But when we say H is *Aspirate*, we only mean, that the vowel immediately following partakes so much of the property of a Consonant, *as to prevent elision with the preceding vowel.* The following examples will illustrate our meaning very clearly, viz. :—

First, of the H Mute.

HABIT	is pronounced	A-BE.
HOMME	"	OM, etc.,

just the same as if printed—ABIT and OMME; in these words there is no sound whatever of the H.

Secondly, of the H Aspirate.

HE'ROS is pronounced AY-RO;

not Hay-ro, as an Englishman would pronounce it, with a strong guttural articulation. But to add to the force and office of the Aspirate H, in the word HE'ROS, let the article LE, be placed before it, thus: LE HE'ROS. Now, if the H were Mute, these two words would become *one* in pronunciation, viz. :—Léros. The H not being Mute in this word Héros, but *Aspirate*, what is its office? It enables the following letter E' to prevent elision with the E of the word preceding it; and consequently, the two words must be pronounced as if printed Le-é-ros.

Thus it will be seen, that one particular use of the aspirated H, is *to prevent elision of the two Vowels between which it may chance to be placed, in being the initial of a word.* H aspirate is best determined by consulting a French dictionary, because no particular and definite Rule can be given for distinguishing it from H mute. It must be granted, that this whole matter is now considered debateable ground among Orthoepists. One side affirms, that the H aspirate is NEVER SOUNDED, *any more than H mute is*, but only serves the sole purpose of preventing elision. The other side affirms, *that the aspiration is very slight*, which, *in common conversation*, amounts to nothing, but is barely observable only in serious reading, and the use of devotional language. One thing, however, is quite certain:—that a native Frenchman never aspirates the H of his own language, *as we do* in pronouncing the words HAVE, HIGH, HOLD and HULL.

54. J j.

This letter, has the sound of the two English letters ZH. In the two English words—*glazier* and *azure*—the Z has the sound of ZH, viz. :—*glazhier* and *azhure*.

French.	Pronunciation.	English.
Jalon	Zha-lonh'	*Beacon.*
Jamais	Zha-may	*Always.*
Jet	Zhay	*Stream.*
Joujou	Zhoo-zhoo	*A toy.*

55. K k.

This letter has the sound of the English K, *in all situations.*

56. L l.

This letter has the sound of the English L, in nearly all situations, except when used with the Vowel I, as a liquid. In a few words, L final is silent. The dictionary will best determine which these are.

57. M m.

When *initial*, the letter M has only the sound of English M. It is used in Nasal combinations like the following, viz. :—

em	in	um	end
em	om	ym	in old French;—

which sounds will be illustrated at the proper place. It is also *silent* in the body of some words. Refer to the dictionery to determine when.

58. N n.

When *initial*, the letter N has only the sound of English N. It is used in Nasal combinations mostly, viz. :—

an	in	un	and
en	on	yn	in old French;

which sounds will be illustrated in the proper place.

After M and N in the end of words, final consonants are usually silent, viz. :—

Prends	as if printed	Pren,	and pronounced	Pranh'
Romps	"	Ron,	"	Ronh'
Temps	"	Tan,	"	Tanh'

When N is final before another word beginning with a Vowel or H mute, it requires, besides being pronounced with a Nasal sound, that another N should be added in pronunciation to the beginning of the next word, viz. :—

ANCIEN AMI	as if printed	ANCIEN NAMI.
BON HOMME	"	BON NOMME.
MON AME	"	MON NÂME.
MON INTIME AMI	"	MON-NIN-TI-MA-MI.

59. P p.

When initial, and in the body of words, P is usually sounded; and then it has the sound of English P. When final, it is generally silent. Exceptions will best be found out by consulting a French dictionary.

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LESSONS IN ARITHMETIC.—No. XXX.

DECIMAL FRACTIONS.

Fractions which decrease in a tenfold ratio, or which express simply decimal parts, as tenths, hundredths, thousandths, etc., are called Decimal Fractions.

They arise from dividing a *unit* into *ten* equal parts, then dividing each of these parts into *ten other* equal parts, and so on. Thus, if a *unit* is divided into 10 equal parts, 1 of those parts is called a *tenth*. If a *tenth* is divided into 10 equal parts, 1 of those parts will be a *hundredth*; for $\frac{1}{10} \div 10 = \frac{1}{100}$. If a *hundredth* is divided into 10 equal parts, 1 of the parts will be a *thousandth*; for $\frac{1}{100} \div 10 = \frac{1}{1000}$, etc.

Each order of whole numbers, we have seen, *increases* in value from units towards the left in a tenfold ratio; and, conversely, each order must *decrease* from left to right in the same ratio, until we come to units' place again. By extending this scale of notation below units towards the right hand, it is manifest that the *first* place on the right of units will be *ten times* less in value than *units'* place; that the *second* will be ten times less than the *first*; the *third* ten times less than the *second*, etc. Thus we have a series of *orders* below units, which *decrease* in a *tenfold ratio*, and exactly correspond in value with *tenths, hundredths, thousandths*, etc.

Decimal Fractions are commonly expressed by writing the numerator with a point (·) before it.

The point placed before decimals is called the *Decimal Point*, or *Separatrix*. Its object is to distinguish the fractional parts from whole numbers.

If the numerator does not contain so many figures as there are ciphers in the denominator, the deficiency must be supplied by prefixing ciphers to it. For example, $\frac{1}{10}$ is written thus, ·1; $\frac{2}{10}$ thus ·2; $\frac{3}{10}$ thus, ·3; etc. $\frac{1}{100}$ is written thus, ·01, putting the one in hundredths' place; $\frac{5}{100}$ thus, ·05; etc. That is, tenths are written in the *first* place on the right of units; hundredths in the *second* place; thousandths in the *third* places, etc.

The denominator of a decimal fraction is always 1 *with as many ciphers annexed to it, as there are figures, or figures and ciphers, in the given numerator, when properly pointed.*

The names of the different *orders of decimals*, or places below units, may be easily learnt from the following

DECIMAL TABLE.

Hundred thousands.	Ten thousands	Thousands.	Hundreds.	Tens.	*Units.*	(Decimal Point.)	Tenths.	Hundredths.	*Thousandths.*	Ten thousandths.	Hundred thousandths.	*Millionths.*	Ten millionths.	Hundred millionths.	*Billionths.*	Ten billionths.	Hundred billionths.	*Trillionths*, etc.
7	5	6	4	2	3	·	2	6	7	1	4	5	9	8	6	2	7	4

It will be seen from this table that the *value* of each figure in *decimals*, as well as in whole numbers, depends upon the *place* it occupies, reckoning from units. Thus, if a figure stands in the *first* place on the right of units, it expresses *tenths*; if in the *second*, *hundredths*, etc.; each successive place or order towards the right, decreasing in value in a tenfold ratio. *Hence each removal of a decimal figure one place from units towards the right, diminishes its value ten times. Prefixing* a cipher, therefore, to a decimal diminishes its value *ten times*; for, it removes the decimal one place farther from units' place. Thus, ·4 = $\frac{4}{10}$; but ·04 = $\frac{4}{100}$; and ·004 = $\frac{4}{1000}$, etc.; for the denominator to a decimal fraction is 1, with as many ciphers annexed to it as there are figures in the numerator.

Annexing ciphers to decimals does not alter their value; for, each significant figure continues to occupy the same place from units as before. Thus, ·5 = $\frac{5}{10}$; so ·50 = $\frac{50}{100}$, or $\frac{5}{10}$, by dividing the numerator and denominator by 10; and ·500 = $\frac{500}{1000}$, or $\frac{5}{10}$, etc.

It should be remembered that the *units'* place is always the *right hand* place of a whole number. The effect of annexing and prefixing ciphers to decimals, it will be perceived, is the *reverse* of annexing and prefixing them to whole numbers. A whole number and a decimal, written together, is called a *mixed number*.

1. To read decimal fractions.

Rule.—*Beginning at the left hand, read the figures as if they were whole numbers, and to the last one add the name of its order.* Thus,

·7	is read	7 tenths.
·36	,,	36 hundredths.
·475	,,	475 thousandths.
·6342	,,	6342 ten thousandths.
·57834	,,	57834 hundred thousandths.
·284648	,,	284648 millionths.
·8913629	,,	8913629 ten millionths.

In reading decimals, as well as whole numbers, the *units'* place should always be made the *starting* point. It is advisable for the learner to apply to every figure the name of its order, or the place which it occupies, before attempting to read them. Beginning at the units' place, he should proceed towards the right, thus,—*units, tenths, hundredths, thousandths*, etc., pointing to each figure as he pronounces the name of its order. In this way he will be able to read decimals with as much ease as he can whole numbers.

EXERCISES.

Read the following decimal and mixed numbers:—

1	2	3	4
·32	42·068	6·00754	4·306702
·246	17·401	3·0468	0·007006
·3624	23·07	2·306843	1·13004
·82344	81·4389	1·710386	9.203107
·13236	00·0104	2·463126	9 2000076
·46274	12·683	6·004534	8·0403842
·03667	20 004	1·100492	0·0000008
·00368	35·0072	9·000028	4·3008004
·00046	67·4008	8·001249	7·4627350
·00009	9·0007	0·100010	1·0006003

Sometimes we pronounce the word *decimal* when we come to the separatrix, and then read the figures as if they were whole numbers; or, simply repeat them one after another. Thus, 125·427 is read, one hundred and twenty-five, *decimal* four hundred and twenty-seven; or, one hundred and twenty-five, *decimal* four, two, seven.

Write the fractional part of the following mixed numbers in decimals:—

5.	6.	7.	8.
$25\frac{7}{10}$	$4\frac{15}{100}$	$43\frac{214}{1000}$	$3\frac{2132847}{10000000}$
$30\frac{93}{100}$	$6\frac{32}{1000}$	$13\frac{69}{1000}$	$8\frac{8}{1000}\frac{8}{000}$
$72\frac{82}{100}$	$7\frac{63}{1000}$	$41\frac{251}{1000}$	$9\frac{1111111}{10000000}$

9. Write 9 tenths; 25 hundredths; 45 thousandths.
10. Write 6 hundredths; 7 thousandths; 132 ten thousandths.
11. Write 462 thousandths; 2891 ten thousandths.
12. Write 25 hundred thousandths; 25 millionths.
13. Write 1637246 ten millionths; 65 hundred millionths.
14. Write 71 thousandths; 7 millionths.
15. Write 23 hundredths; 19 ten thousandths.
16. Write 261 hundred thousandths; 65 hundredths; 121 millionths; 751 trillionths.

Decimal Fractions, it will be perceived, differ from *Common* Fractions both in their *origin* and in the *manner of expressing them*. Common Fractions arise from dividing a *unit* into *any* number of *equal* parts; consequently, the *denominator* may be *any number whatever*. Decimals arise from dividing a *unit* into *ten equal* parts, then subdividing each of those parts into *ten other equal* parts, and so on; consequently, the denominator is always 10, 100, 1000, etc. Again, *Common Fractions* are expressed by writing the *numerator* over the *denominator*. *Decimals* are expressed by writing the *numerator only*, with a point before it, while the denominator is understood.

Decimals are *added*, *subtracted*, *multiplied*, and *divided*, in the same manner as whole numbers.

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The only thing with which the learner is likely to find any difficulty, is *pointing off* the answer. To this part of the operation he should give particular attention.

ADDITION OF DECIMAL FRACTIONS.

Example.—What is the sum of 28·35; 345·329; 568·5; and 6·485?

Explanation.

Write the *units* under *units*, *tenths* under *tenths*, *hundredths* under *hundredths*, etc.; then, beginning at the right hand or lowest order, proceed thus: 5 thousandths and 9 thousandths are 14 thousandths. Write the 4 under the column added, and carrying the 1 to the next column, proceed through all the orders in the same manner as in simple addition. Finally, place the decimal point in the amount directly under that in the numbers added.

Operation.

28·35
345·329
568.5
6·485
948.664 *Ans.*

To add together Decimal Fractions or Mixed Numbers.

RULE.—*Write the decimal or mixed numbers so that the same orders may stand under each other, placing units under units, tenths under tenths, hundredths under hundredths, etc. Begin at the right hand or lowest order, and proceed in all respects as in adding whole numbers. From the right hand of the amount, point off as many figures for decimals as are equal to the greatest number of decimal places in any one of the given numbers.*

PROOF.—*Addition of Decimals is proved in the same manner as Simple Addition.*

The decimal point in the *answer* will always fall directly under the decimal points in the given numbers, if they are rightly arranged.

EXERCISES.

1. What is the sum of 25·7; 6·389; 23·058; and 57·145?
2. What is the sum of 38·258; 2·0675; 382·45; and 7·2984?
3. What is the sum of 32·764; 5·76; 16·0037; and 49·3046?
4. What is the sum of 1·03041; 6·578034; 2·4178; and 4·72103?
5. Add together 4·25; 8·293; 4·612; 38·07; 2·056; 3·248; and 1·62.
6. Add together 35·7603; 47·0076; 129·03; 100·007; and 20·32.
7. Add together 467·3004; 28·78249; 1·29468; and 3·76241.
8. Add together 24·6434; 800·7; 29·461; 1·7508; and 3·45.
9. Add together 45·001; 163·4234; 20·3045; 634·2104; and 234·90213.
10. Add together 293·0072; 89·00301; 29·84567; 924·00369; and 72·39602.
11. Add together 1·721341; 8·820047; 51·720345; 2·684; and 62·304607.
12. Add together 1·293082; 3·00042; 9·7003146; 3·600428; 7·0040031; and 6·7200489.
13. Add together 394·61; 81·928; 3624·8103; 840·203; 8291·302; 721·004; and 3920·304.
14. Add together 25 hundredths, 8 tenths, 65 thousandths, 16 hundredths, 142 thousandths, and 39 hundredths.
15. Add together 9 tenths, 92 hundredths, 162 thousandths, 489 thousandths, and 92 millionths.
16. Add together 45 thousandths, 1752 millionths, 624 ten millionths, and 24368 millionths.
17. Add together 29 hundredths, 7 millionths, 62 thousandths, and 12567 ten millionths.
18. Add together 95 thousandths, 61 millionths, 6 tenths, 11 hondredths, and 265 hundred thousandths.
19. Add together 1 tenth, 2 hundredths, 16 thousandths, 7 millionths, 26 thousandths, 95 ten millionths, and 7 ten thousandths.
20. Add together 96 hundred thousandths, 92 millionths, 25 hundredths, 45 thousandths, and 7 tenths.
21. Add together 65 thousandths, 17 hundredths, 36 ten thousandths, 58 millionths, 363 hundred thousandths, 185 millionths, and 673 ten thousandths.

LESSONS IN GREEK.—No. I.

BY JOHN R. BEARD, D.D.

THE PARTS OF A SIMPLE SENTENCE CONSIDERED SEPARATELY; THEIR AGREEMENT.

Simple Sentences.

IF, after these general explanations, we proceed to consider the particular parts of a simple sentence, we come first to the subject. The subject is commonly a noun or substantive, properly so called, since it is only of a substance or a reality that a statement may be made. But, instead of a substantive itself, we may have a representative of a substantive. A substantive may be represented by an adjective or participle, used substantively. A substantive may also be represented by an infinitive mood with the article; also the personal pronouns, or the demonstrative pronouns may be employed as subjects, instead of substantives. In short, any word or combination of words that have a substantive force, may stand as the subject of a proposition. Examples occur in the exercises.

The employment of adjectives in the sense of substantives is more common in Greek than in English. Adjectives are used as nouns.

1. To denote persons either with or without the article. Thus, ξενος, *foreign*, may signify *a foreigner* and *a guest*; and ὁ ξενος, *the guest*; καλος, *a handsome man*; καλη, *a handsome woman*; μωρος, *a fool*; αρρην, *a male*; θηλεια, *a female*; a participle may also have the force of a noun, as ὁ μαθων, *he who has learnt*, that is, *the scholar*; αποστατης (our *apostate*), *he who has gone away from*, that is *a runaway*. Less frequently is the neuter used to denote a person; thus, however, το αρρεν, *the man, is employed*; and το θηλυ, *the woman*; τα φιλουμενον, *the beloved object*; such use is common when a class or a general idea is intended, thus το αρρεν, *the male, the male sex*; το θηλυ, *the female sex*; τα Ἑλληνικον, *the Grecian people*; το ἱππικον, *the cavalry*, or *cavalry*; το νεαν, *youth*; το κρατιστον του στρατευματος, *the elite of the army*. This employment of the adjective as a noun does not exclude the use of the noun together with the adjective. Thus, sometimes ανηρ and γυνη are added, *e.g.* ὁ σοφος. *the sage*, and ὁ σοφος ανηρ, *the wise man*; ἡ καλη, *the beauty*, and ἡ καλη γυνη, *the beautiful woman*.

2. The neuter of the adjective is often used to express relation of space, as τα μεσον, *the middle*; το ἐσχατον, *the extremity, the brink*; το ὁμαλον, *the plain*; τα ἐπιθαλασσια, *the sea-coast*; also to express relations of time, as επι πολυ, *for a long while*; εξ ἑωθινου, *in the morning*; moreover, to express the stuff or essence of which a thing consists, as τα εν ανθρωπος κακον, *what is bad in man*; a collective idea, equivalent to *the qualities* of man, man's inferior nature, sin, "the flesh;" τα ξηρα, τα ὑγρα, *the dry, the moist* (bodies), το ξηρον, το ὑγρον, *dryness* (drought), *moisture*; τα συγγενες, *relationship*; τα ασφαλες, *security*; το βασιλικον, *royalty*; by the neuter the Greeks thus expressed abstractions, that is, the quality of an object in its most abstract form.

Nouns which we use only in the singular, the Greeks employed in the plural, when repetition was intended. Thus, we speak of "the heat of summer," and "the cold of winter;" of good fortune and bad fortune; where the Greeks employ plural nouns; as ψυχη χειμωνος και θαλπη θερους. We also say of persons that "they are wise in heart," but the Greeks, using the plural, said χρηστοι τας ψυχας, good in *spirits*, when they spoke of several persons; so also ἡμεροι τους τροπους, *of a mild disposition*; though the singular is also found, as ἡδυς την ὀψιν, *pleasant of visage*.

The Greeks used the plural when they wished to denote a substance divided into parts, *e.g.* ναυπηγησιμα ξυλα, literally ship-building woods, that is, *planks or beams for ship-building*; also to denote a body or object which consisted of more than one part, *e.g.* θυραι, πυλαι, *doors, gates* ("folding-doors"); moreover, when they spoke of an object which, though singular in itself, conveyed the idea of plurality, as γαμοι, marriages, that is, *marriage-festivities*; ταφαι, *funeral rites*; τα Ελευσινια, *the Eleusinian mysteries*. The plural of proper names signified people of the kind, *e.g.* Οδυσσευς, Φιλιππος,

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Γοργιας. Δημοσθενης, as we say, "the Ciceros," "the Howards."

The singular is also employed to signify a plural object, when that object is considered collectively, and so presents to the mind the idea of *one, unity*. Thus, as we speak of *plate* for *silver utensils*, so the Greeks used αργυρος, *articles of silver*; χρυσος, *articles of gold*, "gold plate;" κεραμος, *earthen ware*; πλινθος, *stone ware*; καραξ, *palisades*. Similar is the case when a general noun is used to denote a supply of the articles of the kind; thus, εσθης, *raiment*, means *a supply of clothes* (a wardrobe); or when an instrument is mentioned to signify the persons by whom it is used, as κωπη, *an oar* for *rowers* or *sailors*; ασπις, *a shield*, for *shield-bearers*.

Sometimes the subject is not expressed by a separate word, as when the subject is a personal pronoun, *e.g.* γραφομεν, *we write*; or when the act declared in the predicate is of such a nature as to be referable only to a particular person, or to be implied in the verb itself; thus, with κηρυσσω, *I herald, proclaim*, the word, κηρυξ, *herald*, is omitted; and σαλπιστης, *trumpeter*, with σαλπιγγω, *I announce by the sound of a trumpet*. The subject is also omitted with what are called impersonal (unipersonal) verbs, as νιφει, *it snows*; βροντᾳ, *it thunders*; αστραπτει, *it lightens*; Ζευς, *Jupiter*, being, it is said, understood.

The subject has sometimes to be learnt from the connexion, as in φασι, *they affirm*; λεγουσι, *they say*; ανθρωποι, or something of the kind being implied.

The force of the indefinite pronoun, *some one*, is given either by τις, or by the form just mentioned, namely, λεγουσι, or impersonally by λεγεται, *it is said*; or personally, λεγομαι, *I am said*; or, again, by the second person singular optative active, with αν, as φαιης αν (dicas), *you may say*.

If, however, it is intended to present the subject with any emphasis, then the subject, even if a pronoun, must be expressed. Consequently, when the personal pronoun is used, you may infer that emphasis is intended; thus, τι φῃς; is simply *what dost thou say?* but τι δε συ φῃς; is, what dost *thou* say?

As the subject, for instance the third person singular, *he*, is omitted, when reference is made to a subject, a proper name gone before, so in construing from Greek into English, you must supply the pronoun whether singular or plural, before every succeeding verb; instances occur in every Greek period and narrative.

The Predicate and the Copula.

The predicate, as expressive of a quality, may appear in the form of an adjective (the attribute), with or without a copula; or it may blend with a verb, so as to present in one word the entire proposition or statement, *e.g.*—

		Pred.	
	Subj.	*Cop.*	*Attrib.*
The predicate, an adj. and copula	το ῥοδον	εστι	καλον
The predicate, an adj. without cop.	το ῥοδον		καλον
The predicate and copula in one	το ῥοδον	θαλλει	
Sub., copula, and pred. in one		θαλλω.	

The disuse of the copula, as in το ῥοδον καλον, is more apparent than real. Occurring for the most part in the third person singular, it can take place only when it may be readily supplied from the words employed. It is, indeed, rather in the form than in the sense that the copula is ever dropped.

Instead of an adjective you may have in the predicate an equivalent, that is, a pronoun, a noun used as an adjective, or participle.

Concord of the Parts of a Sentence.

The form of the subject has great influence on the form of the other parts of a sentence. The form of the subject determines the form of the copula. The form of the subject determines also the form of the attribute, when that attribute is an adjective. By these statements I mean that if the subject is in the first person, in the first person must the copula or verb be. The two must also be in the same number, and the attribute must agree with the subject in gender, in number, and in case. If, however, the attribute is a noun, then it may agree in case only, or in case and number.

Παραδειγμα ειμι εγω
I am an example.

Where παραδειγμα is of the neuter gender, while εγω is masculine or feminine.

A subject in the neuter plural takes its verb in the singular, *e.g.*

Παντα τα θνητα πεφυκε
All animals are naturally mortal.

With personal nouns, however, the plural is used when the idea of plurality is made prominent; *e.g.*

Τα μειρακια επηνεσαν τον λεγοντα
The young men (individually) applauded the speaker.

If the subject is a collective word, and if its parts rather than its totality are regarded, then, though singular in form, it will take a verb in the plural; *e.g.*

Το στρατοπεδον ανεχωρουν
The camp (the soldiers) returned.

When the subject consists of two or more nouns, the verb is in the plural. The rule remains if both nouns are of the singular number. Though sometimes the verb agrees with the nearest noun, and is then in the singular.

Ἡ μητηρ και ἡ θυγατηρ ησαν καλαι
The mother and the daughter were fair.

Φιλεῖ σε ὁ πατηρ και ἡ μητηρ
Thy father loves thee, also thy mother.

If the subjects are of one gender, then the predicate must be of that same gender; but if the subjects are in part masculine and in part feminine, then the predicate must be masculine; if, again, the subject is in the neuter gender, or has reference to things, then the predicate is neuter.

When subjects of several persons are united, the first person determines the person of the verb; if there is no first person, then the person of the verb is determined by the second person; any way the verb is in the plural.

When the subject is a general idea, the predicate may be in the neuter singular, whatever the number or gender of the subject; *e.g.*

Αι μεταβολαι λυπηρον
Changes are a painful thing.

With a dual subject the verb is in the dual, if the two objects are considered specially as two, otherwise the verb may be in the plural; and thus, a verb in the plural may follow a verb in the dual, because the idea of the duality is now lost. This is an instance of that agreement which is called κατα συνεσιν, *the agreement according to the sense*, in opposition to the agreement according to the sound or the form. Instances of both are found in Greek; and reference to this remark will explain several constructions; examples are given in the following exercise.

When a pronoun refers to a noun, it agrees with that noun, in gender, number, and case; though sometimes a demonstrative pronoun is put in the neuter gender. If the pronoun is a personal pronoun, then the noun and the pronoun agree also in person.

The verbal adjectives in τος and τεος when used, like the Latin gerund, impersonally, stand mostly in the neuter plural.

If the predicate is a superlative, and is connected with a genitive, it takes its gender from the gender of the subject.

The attribute is connected with the subject, not only by ειναι, but by other verbs which in themselves do not convey a complete idea. Such verbs are ὑπαρχειν, *to exist*; γιγνεσθαι, *to become*; φυναι, *to arise*; αυξανεσθαι, *to grow*; φαινεσθαι, *to appear*; καλεισθαι, *to be called*; ονομαζεσθαι, *to be named*; λεγεσθαι, *to be said* (dici). In a similar manner are employed

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αἱρεῖσθαι, to be chosen; ἀποδεικνυσθαι, to be declared, or appointed; νομιζεσθαι, to be accounted, to be held for something or somebody, etc. These verbs take the same case after as before them, and their predicates are sometimes substantives; *e.g. Κυρος εγενετο βασιλευς των Περσων, Cyrus became king of the Persians.*

EXERCISES.—GREEK-ENGLISH.

Ολιγοι ἐμφρονες πολλων ἀφρονων φοβερωτεροι. Οργη φιλοὐντων ολιγον ισχυει χρονον. Των κακῶν, φασι, πλειω εστι κατα τον βιον η των ἀγαθων. Ἡ χωρα πολλα ἐχει ορεινα. Ἡ γεωργια ψυχη τε χειμωνος και θαλπη θρους εθιζει καρτερεῖν. Αἱ μεν ευτυχιαι τας κακιας συγκρυπτουσιν, αἱ δε δυσπραξιαι ταχιως καταφανεῖς ποιοῦσιν. Επει οἱ πολεμιοι ανηλθον, εκηρυξε τοις Ἕλλησι παρασκευασασθαι. Τριες ηλθον. Ὁ σοφος ενδαιμων εστιν. Οἱ παλαι ησαν ανδρεῖοι. Οἱ περι Μιλτιαδην καλως εμαχεσαντο. Το διδασκειν καλον εστιν. Το ει συνδεσμος εστιν. Αποκτενῶ σε· συ δε; ουκ εγω σε αποκτεινῶ, αλλ' ὁ της πολεως νομος. Παντες επαινοῦμεν ἀ συ λεγεις. Σωκρατης αει ην εν τῳ φανερῳ· πρωῖ τε γαρ εις τους περιπατους και τα γυμνασια ει, και το λοιπον αει τῆς ἡμερας ην ὁπου· πλειστοις μελλοι συνεσεσθαι. Ἀδηλον το μελλον. Θεων δυναμις μεγιστη. Θνητοι οἱ ανθρωποι. Ἕλλην εγω. Ουχ οἱον τε ανευ δικαιοσυνης ἀγαθον πολιτην γενεσθαι. Κυρος βασιλευς ην πρῶτος των Περσων. Το των Περσων ἐθνος μαχιμωτατον και ανδρειοτατον ἐφυ. Ἡ θυγατηρ σου καλη εστι και ἀγαθη. Παρεπιδημια τις ἐστιν ὁ βιος. Τα δικαια και παντα, ἁσα αρετῃ πραττεται, καλα ἐστι και ἀγαθα. Τοσαδε ἐθνη μετα Ἀθηναιων ἐστρατευον. Φανερα ησαν και ἱππων και ανθρωπων ἐχνη πολλα. Τί φυλαν αλλο η ανθρωποι θεους θεραπευουσιν; Ὁ δημος εις το θεατρον προελθοντες ἐβοων. Ἐγω και συ και ἐκεῖνος γραφομεν. Φιλιππος και Ἀλεξανδρος πολλα και θαυμαστα ἐργα απεδειξαντο. Πελοπιδας και Ἐπαμεινωνδας σοφρονεστατοι ησαν. Ὁ ανηρ και ἡ γυνη ἀγαθοι ησαν. Ὡς εἶδε πατερα τε και μητερα και ἀδελφους και την ἑαυτου γοναῖκα αἰσχιστα πεπονθοτας, ἐδακρυεν. Ἡ ἀγορα και το Πρυτανεῖον παρῳ λιθῳ πεπεμενα ην. Ἀνθοι τε και πλινθοι και ξυλα και κεραμος ἐρῥιμενα ουδεν χρησιμα ἐστιν. Συ και ἐκεῖνος γραφετε. Ἡμεις και ἐκεῖνοι γραφομεν. Ουκ ἀγαθον πολυκοιρανια. Ἡ μοναρχια κρατιστον. Αἱ χορηγιαι ικανον ευδαιμονιας σημειον ἐστιν. Ὡς εἶδεν ἀλληλους ἡ γυνη και ὁ Ἀβραδατης, ησπασαντο ἀλληλους. Τα μειρακια ταδε προς ἀλληλους διαλεγομενοι θαμα ἐπεμεμνηντο Σωκρατους. Εἶδον το παιδιον ὑπ' ἐρᾷ ὁ ἀδελφος. Δικαστοῦ αὐτη ἐστιν αρετη. Ἐστι δε τουτο τυραννις. Τουτο θανατος ονομαζεται, λυσις και χωρισμος ψυχῆς απο σωματος. Αὐτη ἐστι πηγη και αρχη παντων των κακων. Φθονος χαλεπωτατος ἐστε των νοσων. Ὁ ἡλιος παντων λαμπροτατος ἐστιν. Καλον ἡ αληθεια και μονιμον. Ἀσθενεστερον γυνη ανδρος. Κυρος ην βασιλευς. Ἀλκιβιαδης ἡρεθη στρατηγος. Δια τουτων Φιλιππος ηὐξηθη μεγας. Τα πραγματα ουτω πεφῦκεν.

VOCABULARY, QUESTIONS, ETC.

Παρασκευαζω, *I make ready*; mid., I pack up baggage, I prepare for battle (*παρα* and *σκευη, preparation*, ακινος, a prepared thing, an instrument, a utensil).

Συνδεσμος, ου, ὁ, a chain, a binding, *a conjunction*, το ει, the particle *ει*.

Οἱος τε, *I am able*; ουκ οἱον τε, *it is not possible*.

Φυω, *I beget*, φῦναι, to arise, to be simply; τα πραγ. οὕτω πεφῦκειν, things are in this condition.

Παρεπιδημια (*παρα*, from; *επιδημια*, a tarrying), a sojourn, dwelling away from home.

Ἰχνος, ους, το, a trace, footstep, vestige.

Πρυτανεῖον, ου, το, the Prytaneum, a public edifice where foreign envoys and distinguished citizens received hospitality at Athens, at the public expense.

Κεραμος, ου, ὁ (*ερα*, earth), earthenware, pottery.

Ασπαζω, I embrace.

What is the gender, number, and case of the following words, and why? ψυχη; ενδαιμων; καλον; θνητοι; μαχιμωτατον; ἀγαθοι; αἰχμαλωτους γεγενημενους; ὑς; αὐτη; τουτο (with *θανατος*), καλον (with ἡ αληθεια); στρατηγος; ἀσθενεστερον.

What is the person and the number of the following verbs, and why? πεφῦκεν; θεραπευουσιν; ἐβοων; γραφομεν; ἐδεητην; ησπασαντο; επεμεμνηντο; εμαχεσαντο; αποκτενῶ; επαινοῦμεν.

Supply what is understood in these sentences:—Ἕλλην εγω; θνητοι οἱ ανθρωποι; ἀδηλον το μελλον.

ENGLISH-GREEK.

Six (persons) came. We two came. He and you are good. My father and I are good. Xenophon was chosen general. Those two men were chosen generals and they prepared to go against the enemy. I say that thou art bad. Thou (sayest so)? I say it. You are wise, not they. We are Greeks. Future things are uncertain. Man is mortal. My sister is mortal. My brothers and sisters are mortal. You and I are mortal. That is folly. To be sound minded is wisdom. The market and the whole city are filled. We and they write. He and I write. Democracy is not a good thing. The men, the women, the children have been prepared. Are riches a sign of happiness? Riches are not a sign of happiness.

LESSONS IN ITALIAN GRAMMAR.—No. XXXVI.

XIII.

Sedére, to sit down.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *sedére*, to sit down	Past: *avére sedúto*, to have sat down
Present Gerund: *sedéndo* or *seggéndo*, sitting down	Past Gerund: *avéndo sedúto*, having sat down
Past Participle: *sedúto*, sat down	

INDICATIVE MOOD.

Present.

Sie'do or *se'ggo*, I sit down
sie'di, thou sittest down
sie'de, he sits down
sediámo or *seggiámo*, we sit down
sede'te, you sit down
sie'dono or *se'ggono*, they sit down

Imperfect.

Sede'va or *sede'a*, I was sitting down
sede'vi, thou wast sitting down
sede'va or *sede'a*, he was sitting down
sedevámo, we were sitting down
sedevate, you were sitting down
sede'vano, *sedíeno*, or *sede'ano*, they were sitting down

Indeterminate Preterite.

Sedé'i or *sede'tti*, I sat down
sede'sti, thou sattest down
sedè, *sedé'tte*, or *sede'a*, he sat down
sedémmo, we sat down
sede'ste, you sat down
sedé'rono, *sedé'ttero*, or *sedie're*, they sat down

Future.

Sederò or *sedrò*, I shall or will sit down
sederái, thou wilt sit down
sederà, he will sit down
sederémo, we will sit down
sederé'te, you will sit down
sederánno, they will sit down

Conditional Present.

Sederé'i, *sedré'i*, or *sedería* I should or would sit down
sederé'sti, thou wouldst sit down
sederé'bbe, he would sit down
sederé'mmo, we would sit down
sederé'ste, you would sit down
sederé'bbero, they would sit down

IMPERATIVE MOOD.

[No First Person.]

Sie'di, sit (thou) down
sie'da or *se'gga*, let him sit down
sediámo or *seggiámo*, let us sit down
sede'te, sit (ye or you) down
sie'dano or *se'ggano*, let them sit down

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Subjunctive Mood.

Present.	Imperfect.
Che sié'da, se'gga, or *se'ggia,* that I may sit down	*Che sedé'ssi,* that I might sit down
che sié'da, se'gga, se'ggia, or *se'ggi,* that thou mayst sit down	*che sedé'ssi,* that thou mightst sit down
che sié'da or *se'gga,* that he may sit down	*che sedé'sse,* that he might sit down
che sediámo or *seggiámo,* that we may sit down	*che sedé'ssimo,* that we might sit down
che sediáte or *seggiáte,* that you may sit down	*che sedé'ste,* that you might sit down
che sié'dano, se'ggano, or *se'ggiano,* that they may sit down	*che sedé'ssero,* that they might sit down

So conjugate—

Possedé're, to possess | *Risedé're,* to reside
Presedé're, to preside | *Soprassedé're,* to supersede

XIV.

Solére, to be accustomed.

Infinitive Mood.

Present: *solére,* to be accustomed | Present Gerund: *soléndo,* being accustomed

[No Past Participle.]

Indicative Mood.

Present.	Imperfect.
Sóglio, I am accustomed	*Sole'va* or *sole'a,* I was accustomed
suóli, thou art accustomed	*sole'vi,* thou wast accustomed
suóle or *sóle,* he is accustomed	*sole'va, sole'a,* or *solía,* he was accustomed
sogliámo, we are accustomed	*solevámo,* we were accustomed
sole'te, you are accustomed	*solevate,* you were accustomed
sógliono, they are accustomed	*sole'vano* or *sole'ano,* they were accustomed

Subjunctive Mood.

Present.	Imperfect.
Che sóglia, that I may be accustomed	*Che sole'ssi,* that I might be accustomed
che sóglia, that thou mayst be accustomed	*che sole'ssi,* that thou mightst be accustomed
che sóglia, that he may be accustomed	*che sole'sse,* that he might be accustomed
che sogliámo, that we may be accustomed	*che sole'ssimo,* that we might be accustomed
che sogliáte, that you may be accustomed	*che sole'ste,* that you might be accustomed
che sógliano, that they may be accustomed	*che sole'ssero,* that they might be accustomed

The deficiency of the tenses wanting is supplied by the verb *éssere sólito;* and the word *sólito,* may, in some measure, be considered a participle.

XV.

Tacére, to be silent.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *tacére,* to be silent	Past: *avére taciúto,* to have been silent
Present Gerund: *tacéndo,* being silent	Past Gerund: *avéndo taciúto,* having been silent
Past Participle: *taciúto,* been silent	

Indicative Mood.

Present.	
Táccio or *tácio,* I am silent	*tacémmo,* we were silent
táci, thou art silent	*tacéste,* you were silent
táce, he is silent	*táciquero,* they were silent
tacciámo or *taciámo,* we are silent	Future.
tacéte, you are silent	*Tacerò,* I shall or will be silent
táccione or *táciona,* they are silent	*tacerái,* thou wilt be silent
Imperfect.	*tacerà,* he will be silent
Tacéva or *tacéa,* I was silent	*tacere'mo,* we will be silent
tacévi, thou wast silent	*tacere'te,* you will be silent
tacéva or *tacéa,* he was silent	*tacerànno,* they will be silent
tacevámo, we were silent	Conditional Present.
tacevate, you were silent	*Tacere'i,* I should or would be silent
tacévano, they were silent	*tacere'sti,* thou wouldst be silent
Indeterminate Preterite.	*tacere'bbe,* he would be silent
Táciqui, I was silent	*tacere'mmo,* we would be silent
tacésti, thou wast silent	*tacere'ste,* you would be silent
tácique, he was silent	*tacere'bbero,* they would be silent

Imperative Mood.

[No First Person.]	
Táci, be silent (thou)	*tace'te,* be silent (ye or you)
táccia or *tácia,* let him be silent	*táccíano* or *táciano,* let them be silent
tacciámo, let us be silent	

Subjunctive Mood.

Present.	Imperfect.
Che táccia or *tácia,* that I may be silent	*Che tace'ssi,* that I might be silent
che táccia, tácia, or *táci,* that thou mayst be silent	*che tace'ssi,* that thou mightst be silent
che táccia or *tácia,* that he may be silent	*che tace'sse,* that he might be silent
che tacciámo or *taciámo,* that we may be silent	*che tace'ssimo,* that we might be silent
che taciáte, that you may be silent	*che tace'ste,* that you might be silent
che táccíano or *táciano,* that they may be silent	*che tace'ssero,* that they might be silent

So conjugate—

Ritace're, to be silent again.

XVI.

Tené're to hold.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *tene're,* to hold	Past: *ave're tenúto,* to have held
Present Gerund: *tenéndo,* holding	Past Gerund: *avéndo tenúto,* having held
Past Participle: *tenúto,* held	

Indicative Mood.

Present.	
Téngo, I hold	*tene'vi,* thou wast holding
tie'ni, thou holdest	*tene'va, tene'a,* or *tenía,* he was holding
tiè'ne, he holds	*tenevámo,* we were holding
teniámo, we hold	*tenevate,* you were holding
tene'te, you hold	*tene'vano* or *tene'ano,* they were holding
té'ngono, they hold	Indeterminate Preterite.
Imperfect.	*Té'nni,* I held
Tene'va or *tene'a,* I was holding	

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tene'sti, thou holdest
te'nne, he held
tene'mma, we held
tene'ste, you held
te'ncro, they held

Future.

terrò, I shall or will hold
terrài, thou wilt hold
terrà, he will hold
terre'mo, we will hold
terre'te, you will hold
terranno, they will hold

Conditional Present.

terre'i or *terría*, I should or would hold
terre'sti, thou wouldst hold
terre'bbe or *terría*, he would hold
terre'mmo, we would hold
terre'ste, you would hold
terre'bbero or *terríano*, they would hold

Imperative Mood.

[No First Person.]
Tie'ni, hold (thou)
te'nga, let him hold
teniámo, let us hold
teniáte, hold (ye or you)
te'ngano, let them hold

Subjunctive Mood.

Present.
Che te'nga, that I may hold
che te'nga, that thou mayst hold
che te'nga, that he may hold
che teniamo, that we may hold
che teniáte, that you may hold
che te'ngano, that they may hold

Imperfect.
Che tene'ssi, that I might hold
che tene'ssi, that thou mightst hold
che tene'sse, that he might hold
che tene'ssimo, that we might hold
che tene'ste, that you might hold
che tene'ssero, that they might hold

So conjugate—

Appartene're, to belong
Astene're, to abstain
Astene'rsi, to abstain
Attene're, to attain
Contene're, to refrain
Detene're, to detain
Intertene're, to detain
Mantene're, to maintain
Ottene're, to obtain
Pertene're, to belong
Rattene're, to stop
Ritene're, to retain
Sopratene're, to retain
Sostene're, to support
Tratene're, to entertain

Vocabulary.

Andáre, to go
grosso, great, huge
panciúto, big-bellied
prelúto, a prelate
volta, a vault, a road, a turning; *alla volta di*, on the road to, towards
Fiorénza, Florence
vedére, to see
avvicinársi, to approach
notte, night
che, whom, that
incontrára, to meet, encounter
strada, a street, a road
se, if
potére, to be able
ancóra, also, again, still
entrare, to enter
porta, a gate
città, a city
a cui, to whom
villáno, a peasant
poichè, since
carro, a cart
ci, there
come, how
duodécimo, twelfth
muóvere, to move, excite
guerra, war
contro, against
duca, duke
sperimentáto, experienced
capitáno, captain
quale, *qual*, which, what
provisióne, provision
maggiormente, more, particularly
necessário,—*a*, necessary
tre, three
cose, a thing
ci, to you
molto, much, very
danáro, a coin; pl. money
sartóre, a tailor
tanto,—*a*, so much, so
avvézzo, accustomed
rubáre, to rob
panno, cloth
coloro, those
li, *gli*, to him, him
dare, to give
fare, to make, do
vestiti, clothes
astenérsi, to abstain
nè anche, not even
quando, when
lavoráre, to work
per, for
se stesso, himself
perciò, wherefore
miglie, a wife
il quale, which
paúra, fear
pérdere, to lose
sì, so
lodévole, laudable
usanza, custom
perdonare, to pardon, spare

Exercises.

Andándo un grosso e panciúto prelúto alla volta di Fiorénza, a vedéndo avvicinársi la notte, domandò ad un contadíno, che incontrò per strada, se potrébbe ancór entrár alla porta della città? A cui il villáno rispóse: Poichè un carro di fièno ci entra, coma non entrarébbe vossignoría illustrissima?

Voléndo Ludovíco duodécimo móver guerra contro il duca di Miláno, domandò a Giácomo Trivúlzio, sperimentáto capitáno, qual provisióne era maggiormente necessária? A cui il Trivúlzio rispóse: tre cose vi sono molto necessárie: danári, danári, et ancóra danári.

Un sartóre era tanto avvézzo di rubár il panno di coloro che il dávano a far vestiti, cha non potéva astenérsena, nè anche quando lavoráva per sa stesso. Perciò la móglie gli domandò perchè lo facesse? Alla quale egli rispósa; io ho tanta paúra di pérder una si lodévola usanza, che non me la perdóno nè anche a me stesso.

LESSONS IN SPANISH.—No. I.

ORTHOGRAPHY AND PRONUNCIATION.

THE SPANISH ALPHABET.

The Spanish Alphabet contains twenty-eight characters or letters; *a*, *b*, *c*, *ch*, *d*, *e*, *f*, *g*, *h*, *i*, *j*, *k*, *l*, *ll*, *m*, *n*, *ñ*, *o*, *p*, *q*, *r*, *s*, *t*, *u*, *v*, *x*, *y*, *z*.

Of these letters, *a*, *e*, *i*, *o*, *u*, are always vowels; *y* is also a vowel when it ends a syllable or word, or when it stands alone: the other letters are consonants, as also *y* when it begins a syllable or word. The consonants are divided into semi-vowels and mutes; the semi-vowels being *f*, *h*, *l*, *ll*, *m*, *n*, *ñ*, *r*, *s*, *x*; and the mutes, *b*, *c*, *ch*, *d*, *g*, *j*, *k*, *p*, *q*, *t*, *v*, *z*.

Sound of the Simple Vowels.

A, in Spanish, has the sound of a in the English word *far*.

This sound it retains in every position, not varying as in the English words *fare*, *fat*, *far*, *fall*, *swallow*, *many*, *courage*, *mustard*, in no two of which the a has precisely the same sound.

E has the sound of a in *made*, or *e* in *they*.

I has the sound of *ee* in *see*, or *i* in *machine*. Y, when a vowel, has the same sound.

O has the sound of *o* in *go*.

U has the sound of *oo* in *mood*, or *u* in *rude*.

Sound of the Consonants.

B, F, K, L, M, N, P, sound as in English.

C, before a, o, or u, or before a consonant, sounds like *k*; that is, like *c* in the English word *cart*; as, *carne*, *poco*, *cuna*, *cruz*; pronounced *kar'-ney*, *pó-ko*, *koó-nah*, *kray'o*.

C, before *e* or *i*, sounds like *th* in the English word *think*; as, *cecina*, *cima*; pronounced *thay-thee'-nah*, *thee'-mah*.

CH is considered as one letter in Spanish, and is always sounded like *ch* in the English word *church*; as, *noche*, *chapa*; pronounced *nó-chay*, *chah'-pah*.

D has not exactly the same sound in Spanish that it has in English. In the latter it is formed by the tongue touching the roof of the mouth; in Spanish the end of the tongue strikes the upper teeth; it has then a sound nearly like *th* in the English words *than*, *those*.

A person can hardly fail to utter the Spanish sound of the *d*, if he pronounce it as here explained, by applying the tongue to the lower part of the upper teeth, instead of to the roof of the mouth.

G, before *a*, *o*, *u*, or a consonant, sounds hard, as in the English words *gate*, *go*, *goose*, *grow*; as, *goce*, *greba*, *gula*; pronounced *go-thay*, *gray'-bah*, *goo'lah*.

GU, in the syllables *gue* and *gui*, unless there be a diæresis

over the *ü*, is always sounded like the simple *g* hard, as in the English words *guest, guilt;* as, *guela, guita;* pronounced *gay'-lah, gee-tah.* When the diæresis is over the *u* it is not mute, but has its proper sound; as, *egüelo;* pronounced *eh-goo-ai'-o,* or *ah-gway'-lo.*

G, before *e* or *i*, has always the guttural sound of the Spanish *j*.

H is never pronounced, but is always a silent letter; as, *hace, hijo;* pronounced *ah'-thay, ee'-go.*

J has always a guttural sound, somewhat like the English *h* in *alcohol*, strongly aspirated. But this is not an exact equivalent to the Spanish sound, which is produced by breathing strongly (as when one would give additional force to the *h* in *host*), and, by an effort of the palate, making the air gently strike the roof of the mouth.

It is the guttural sound of the *ch* in the German words *nacht* and *nicht*, and of the *ch* in the Scotch words *loch, cloch*, and can therefore be learnt from any German or Scotchman. If we bend the tongue so as to form an arch which presses against the roof of the mouth, and produce a sound by breathing and lowering the tongue, this sound will be that of hard *g*, as it is called in English. If, again, we press the tongue against the roof of the mouth in the same way, and breathe forcibly without changing its position, we produce the exact guttural sound of the Spanish *j*. The learner must bear in mind that the sound of the Spanish *g* before *e* or *i* is the same guttural sound.

K is not used in Spanish, being found only in foreign words, when it is sounded like the same letter in English.

LL sounds like *li* in *pavilion*, or *lli* in *million;* as, *silla, llorc;* pronounced *seel'-yah, lyo-ro.*

As this sound seldom occurs in English, and never at the beginning of words, it requires some practice, for one accustomed to speak English only, to pronounce it readily in such Spanish words as *llaga, llama, llemo, lloro.*

Ñ sounds like *ni* in the English words *onion, pinion;* as, *moña, dueño;* pronounced *mon'-yah, nyon'-yo.*

This sound requires considerable practice before an English learner can pronounce it readily at the beginning of Spanish words such as *ñoclos, ñoña.*

Q, which is always immediately followed by *u*, is sounded as in English; as, *quanto, quota;* pronounced *kwan'-tah, kwo-tah.*

QU, in the syllables *que* and *qui*, is sounded like *k* (that is, the *u* silent); as, *que, quiso;* pronounced *kay, kee-so;* but if a diæresis is over the *ü*, the *u* has its proper Spanish sound; as, *questa;* pronounced *koo-ais'-tah* or *kwess'-tah.*

R is sometimes sounded smooth as in English, and sometimes rough or trilling as with natives of Ireland. The rough sound is heard in Spanish when *r* begins a word, when doubled, and when it comes after *l, n*, or *s;* as, *rabo, carro, alrota;* pronounced *r-rah'-bo, kar-r'-ro, al-r-ro'-tah.* In every other position it has the English smooth sound.

The rough sound of *r* is made by vibrating the end of the tongue against the roof of the mouth near the fore-teeth; it is seldom heard in English, though very easily acquired. The smooth (common English) sound is caused by a vibration of the tongue near the root, against the inward part of the palate, near the entrance of the throat.

S is always sounded as in the English words *soon, this;* as, *sedes;* pronounced *say'-dace.*

The *s* in Spanish never has the sound of *z* as in English, in the words *has, lays.*

T has nearly the same sound as in English. The only difference between the two languages, in pronouncing the *t*, is, that in English the end of the tongue touches the roof of the mouth, and in Spanish it touches the upper teeth. In Spanish, therefore, *t* has a somewhat softer sound than in English.

V is pronounced as in English, with the sole exception that the upper teeth are not pressed so strongly to the lower lip in enouncing this letter in Spanish.

It is a great mistake, which some grammarians have made, to suppose that the Spanish sounds of *b* and *v* are alike.

X has the sound of the English *x* in the word *tax;* as, *exito, extremo, exacto;* pronounced *aiks-ee'-to, aiks-tray'-mo, aiks-ac'-to.*

X, in Spanish, had formerly two very different sounds: the one the same as above given; the other a guttural sound, the same exactly as the Spanish *j*. To distinguish these sounds, the vowel following the *x*, when not guttural, had a circumflex accent over it; as, *exâcto, exîto.* The guttural sound of the *x* is not at present used, or at least very seldom, in Spanish, as the letters *j* (before any vowel) and *g* (before *e* and *i*) have the same sound, and are now employed instead of the guttural *x*. Thus the words *México, Méjico*, or *Mégico*, would, in Spanish, all be pronounced alike; though *Méjico* is the common spelling. It is of course no longer necessary to put a circumflex accent over the vowel following the *x*, when the letter has the English sound of *ks*, as it now has nearly always in recent Spanish writings.

Y, when a consonant, has the same sound in Spanish that it has in English in such words as *young, year.*

Y, when it stands alone, used as a copulative (meaning *and*), is pronounced like *ee* in *see.*

Z has always the sound of *th* in the English word *think;* as, *cazo;* pronounced *thee-tho.*

Remark.—There will be no difficulty on the part of the learner, who is his own instructor, in acquiring the sounds of the Spanish vowels and consonants, except the guttural sound of the *j* (which is also the sound of *g* before *e* or *i*); and this sound can be learnt from any German, by hearing him pronounce *ch* in the words *nacht* and *nicht;* from an Irishman, by noticing the sound he gives *ch* in the word *oich*, from a Scotchman in the word *loch*, or from a Welshman in the words *bach, chwi.*

DIFFERENT METHODS OF SPELLING.

By the best Spanish writers *i* is used instead of *y* when this last letter is a vowel, and not at the end of a word. Thus *reyno, reyna, arraygar*, are now spelt *reino, reina, arraigar.*

Q is now used, by the best writers, only in the syllables *que* and *qui;* as, *queja, quince.* The syllables *qua, qüe, qüi*, and *quo*, are spelt with c. Thus *quando, questa, quota*, are now spelled *cuando, cuesta, cuota.*

X is, by many of the best writers, never used before a consonant, its place being supplied by the letter *s*. Thus *extenso, experto*, are now often found spelt *estenso, esperto.*

In addition to the above remarks, it is proper to state that, by the best writers, *z* is never employed before *e* or *i*, its place being supplied with *c;* thus *cero* and *cinco*, for *zero* and *zinco.* X, too, is, by some few writers, always changed into *es*, when it comes before a vowel; thus *escso*, for *exso.* The guttural sound of *x*, as has been already mentioned, is now seldom used; *g* or *j* being substituted for it.

Remark.—It is necessary to remember that the above variations in spelling produce no variations in pronunciation, except only when *x* before a consonant is changed into *s*, in which case *s* has its own regular sound; thus, *estenso* is pronounced *ais-ten'-so.*

A very little attention to the above directions will remove every difficulty which might otherwise occur in reading Spanish authors who do not adopt the same method of spelling. Thus, if the learner meet with such words as *celo, jeneros, rejistro, cuando, jabon, exceso, exactor, reina, buitre*, etc., and cannot find them in his dictionary, he must look for them under the other forms: *zelo, géneros, registro, quando, xabon, exceso, exactor, reyna, buytre.*

SOUND OF DIPHTHONGS AND TRIPHTHONGS.

The diphthongs and triphthongs in Spanish never contain any vowel sound different from those we have already given. When two or three vowels come together, they may be pronounced by a single effort or emission of the voice; but each vowel in Spanish continues to retain always its own particular sound, though the sounds glide into each other by being pronounced in the time of a single vowel. In the word *rejoice*, in English, the diphthong *oi* contains the sound of each of the letters (*o* like *o* in *not*, and *i* like *i* in *miss*), yet, these

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being pronounced rapidly and with a single impulse of the voice, the two vowel sounds glide into each other. It is thus that the Spanish diphthongs and triphthongs are sounded. Two vowels are never mingled into one and made to represent a sound foreign to each of them, as *ou* in the English word *fought;* or a sound in which only one is heard, as *oa* in *boat*. The diphthong *ua*, in the English word *suavity*, retains the sound of both vowels, being pronounced as if written *swa-vi-ty*. The learner can judge from this example and the last syllable of the word *rejoice*, what is meant by each vowel retaining its own particular sound in diphthongs and triphthongs, though such a combination forms, of course, but one syllable. Thus in the Spanish word *causa*, the letters *cau* compose but one syllable, and the diphthong *au* is pronounced like a in *bar* and *u* in *rude* (the regular Spanish sounds of *a* and *u*); and being uttered quickly, by a single impulse of the voice, the sound of *au* is similar to that of *ow* in the English word *how*, though not exactly the same.

Remark.—In order that the learner who has no instructor to teach him the sounds of the Spanish diphthongs, may not fail to acquire the right pronunciation, we again state that *all the vowels of a diphthong or triphthong, in Spanish, must be pronounced with the regular sound of each, without any perceptible space between the different sounds which compose such diphthong or triphthong.* Thus, in the diphthong of *ea*, the learner has already been taught that the sound of *e* is like that of *e* in the English word *they*, and the sound of *a* like *a* in *are;* all, therefore, that he has to do to form the diphthongal sound, is to unite these two sounds into one breathing or omission of voice. This he can learn to do by pronouncing quickly the words *they-are* so as to form only one syllable, and the *ey-a* will be the exact sound of the Spanish diphthong *ea*. The letters *ai* or *ay* are to be pronounced together, as *a* in *far* and *e* in *me;* that is, as *ay* in *bay* would sound if the *a* had the sound of *a* in *bar*, and the *y* the sound of *y* in *toy* (not the mute *y* as in *bay*). And so with all the diphthongs and triphthongs,

List of Diphthongs.

ai, or *ay*,	has the sound of	*a*	in *bar*,	and *e* in *eel:*	*a-i*
au	,, ,,	*a*	in *bar*,	and *oo* in *mood:*	*a-u*
ea	,, ,,	*e*	in *they*,	and *a* in *bar:*	*e-a*
ei, or *ey*,	,, ,,	*e*	in *they*,	and *ee* in *eel:*	*e-i*
eo	,, ,,	*e*	in *they*,	and *o* in *go:*	*e-o*
eu	,, ,,	*e*	in *they*,	and *oo* in *mood:*	*e-u*
ia	,, ,,	*e*	in *he*,	and *a* in *bar:*	*i-a*
ie	,, ,,	*e*	in *he*,	and *e* in *they:*	*i-e*
io	,, ,,	*e*	in *he*,	and *o* in *go:*	*i-o*
iu	,, ,,	*e*	in *he*,	and *oo* in *mood:*	*i-u*
oa	,, ,,	*o*	in *go*,	and *a* in *they:*	*o-e*
oi, or *oy*,	,, ,,	*o*	in *go*,	and *ee* in *eel:*	*o-i*
ua	,, ,,	*oo*	in *mood*,	and *a* in *bar:*	*u-a*
ue	,, ,,	*oo*	in *mood*,	and *e* in *they:*	*u-e*
ui, or *uy*,	,, ,,	*oo*	in *mood*,	and *ee* in *eel:*	*u-i*
uo	,, ,,	*oo*	in *mood*,	and *o* in *go:*	*u-o*

Triphthongs.

iai	has the sound of	*ee*	in *eel*,	*a* in *bar*, and *e* in *he:*	*i-a-i*
iei	,, ,,	*ee*	in *eel*,	*e* in *they*, and *e* in *he:*	*i-e-i*
uai	,, ,,	*oo*	in *mood*,	*a* in *bar*, and *e* in *he:*	*u-a-i*
uei, or *uey*,	,,	*oo*	in *mood*,	*e* in *they*, and *e* in *he:*	*u-e-i*

Remark.—Some of the diphthongs ending in *i*, will be found in some Spanish writings ending in *y*, as *reina, reyna; buitre, buytre*. The pronunciation in both cases is the same, and we have not increased the list by distinguishing those ending in *i* from those ending in *y*.

The two vowels, when they come together, do not always form one syllable (a diphthong). Thus the word *idea*, in Spanish and English, forms three syllables. In Spanish it is pronounced *ee-day-ah*.

SYLLABICATION.

The rules of Spanish syllabication are very simple. They are the following:—

When a consonant comes between two vowels, it is articulated with the vowel which comes after it; as, *fi-so, d-ño, mi-ya, hu-mi-no, si-llón;* except *x;* as, *ex-ám-plo*.

When two consonants come between two vowels, the former is spelt with the preceding vowel, and the latter with the succeeding vowel; as, *por-tal, cuér-po, és-te, in-vier-no*. This rule is subject to the following exception:

If the first of two consonants coming between two vowels be *f*, or any one of the mutes, and the second *l* or *r*, then both consonants are joined to the vowel by which they are succeeded; as, *si-glo, sué-gro, co-bre, vi-drié-ro*.

When two vowels of the same name come together, or two which do not form a diphthong, they are to be divided; as, *le-ér, co-or-di-nár, ca-nó-a*.

Compound words are to be divided into their derivatives; as, *pre po-nér, ad-jun-to, con-flic-to*.

When any one of the letters *b, l, m, n*, or *r*, is followed by *s* and another consonant, or when *e* is preceded by any consonant, and succeeded by one or more, in compound words, the *e* is to be connected with the consonant which comes before it; as, *Cons-tán-za, cons-tro-nir, ins-pi-rár*.

In Spanish there are as many syllables in a word as there are vowels or diphthongs; as, *quin-ce, ner-te, pa-rien-te*.

In English, the word *quince* forms only one syllable; in Spanish it is pronounced *keen'-thay*. *Hom-bre* is pronounced *om'-brey*, and not *om-bur*, as it would be in English. Every letter in Spanish is pronounced except the *h*, and the *u* in the syllables *gue, gui*, and *que, qui*. There are no silent vowels or consonants, as in the English words *thumb, throne, psalm*.

ACCENT.

In the Spanish the voice never rests or prolongs itself on any other letter of a syllable than a vowel. When we speak of an *accented syllable*, we always mean thereby the *vowel-sound of that syllable*. In the case of diphthongs and triphthongs, when in accented syllables, the accent or stress of voice is generally placed on that vowel which we have marked in the list of diphthongs and triphthongs. Thus, *tie-ne* having the accent on the first syllable, has the stress of the voice on the *e* of the diphthong, though the accent is not written over the vowel.

In words ending in *cion*, the accent is on the *o* and not on the *i* of the diphthong, as marked in the list; as, *re-mur-re-cion*.

The rules of the Spanish accentuation are few and simple, and as follow:—

Words that end in a consonant are accented on the last syllable, without any marked accent over it; as, *caliz*, cup; *capaz*, able; *virtud*, virtue; *jardin*, garden; *saber*, to know; *comer*, to eat; *amar*, to love; *rigor*, rigor; *facilidad*, facility. These are accented as if written *ca-liz, vir-tud, co-mér, fa-ci-li-dád*, etc.

Words that end in a vowel are accented on the syllable next to the last, without any marked accent over it; as, *rastro*, track; *hoja*, leaf; *buitre*, vulture; *temperamenta*, temperature; *ente*, being;—accented as if written *ras-tro, bui-tre, tem-pe-ra-mén-to, én-te*, etc.

Remark.—Words that end in two vowels, whether their vowels form a diphthong or two separate syllables, come under the above rule; as, *estudio*, study; *odio*, hatred; *opulencia*, opulence; *canoa*, canoe; *idea*, idea; accented as if written *és-dio, o-pu-lén-cia, ca-nó-a, i-dé-a*.

Words that end in a consonant and are accented on any other syllable than the last, or that end in a vowel (or diphthong), and are accented on any other than the syllable next to the last, have the accent marked to show the exception from the general rules; as, *circel*, prison; *caracter*, character; *viérnes*, Friday; *virgen*, virgin; or *café*, coffee: *lastima*, pity; *sólido*, solid: *matemático*, mathematician; *cláusula*, clause; accented on the syllable marked.

Remark.—Words that end in two vowels, which are commonly known as diphthongs, usually have the accent marked if it falls on one of these vowels: as *fantasía, poesía, señorío, minué*. Words which end with *y* have the accent on the last syllable, without being marked.

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In compound words there are a few exceptions to the above general rules. In adverbs of quality or manner ending in *mente*, some follow the general rule, and others retain the accent on the first part of the word, on the same syllable on which it would be if *mente* were not affixed; as, *su-cin-ta-mén-te*, succinctly; *li-be-ral-mén-te*, liberally; *bas-tán-te-men-te*, sufficiently; *cier-ta-men-te*, certainly.

The plurals of words retain the accent on the same syllable (whether marked or not) as in the singular; as, *jardín, jardines; cáliz, cálices; vírgen, vírgenes; clavícula, clavículas.* There are two exceptions to this remark, *carácter* and *régimen;* their plurals being accented *caractéres* and *regímenes.*

The above rules are applicable to all parts of speech except the persons of verbs; these are accented according to the following rules:

The persons of verbs whether they end in a consonant or a vowel, whether they are singular or plural, or to whatever mood or tense they belong, are accented on the syllable next to the last, without being marked; as, *hablo*, I speak; *beben*, they drink; *hiciera*, he would make. Infinitives, having no person, are not included in this rule, but are always accented on the last syllable.

In the case of the persons of verbs, whenever the accent does not fall on the syllable next to the last (as mentioned in the preceding rule), it is marked; as, *está*, he is; *hablaré*, I shall speak; *hablarán*, they will speak; *amé*, I loved; *hablábamos*, we were speaking; *hablaríamos*, we would speak. The only exception to this rule is the second person plural of the imperative mood, and words ending in *ay* or *oy*, which are always accented on the last syllable, without the accent in general being marked; as, *hablad*, speak ye; *haced*, make ye; *estoy*, I am. Some writers, however, place the accent over the last syllable, as, *habláid, hacéid.*

The accent is by many writers marked on certain monosyllables, to distinguish them from others of similar orthography and pronunciation but of different meaning; as, *el*, the, and *él*, he; *se*, himself, and *sé*, I know, and *sé*, be thou; *si*, if, and *sí*, to himself. The letters *á*, to; *é*, and; *ó*, or; *ú*, or; are also generally used with a marked accent, though some writers omit it.

Throughout these lessons, every word which does not come under the three general rules of accentuation, will have the accent marked over the vowel upon which the stress of voice is to be laid. The learner must therefore bear in mind that every word which has not a marked accent over some vowel in it, is to be accented in pronouncing it, if it end in a consonant, on the last syllable; if it end in a vowel, on the syllable next the last. If the word be a verb, it is to be accented on the syllable next to the last, whether it end in a consonant or a vowel, except when it has a written accent over it, is in the infinitive mood, or in the second person plural of the imperative, or ends in *y*.*

PUNCTUATION.

The comma, semicolon, colon, period, etc., are the same, and are employed in the same manner as those in English. The marks of interrogation and exclamation are placed in Spanish both before and after interrogative and ejaculatory phrases or sentences;† as, *¿Este canapé no es nuevo?* Is not this sofa new? *¡Que ceguedad! ¡Pobre España!* What blindness! Poor Spain!

The diæresis ¨ is used over the *u* in the syllables *gue, gui, que* and *qui*, when the *u* is to be sounded, as *agüero;* and also over the last of two vowels, which usually form a diphthong to show that they are to be divided into two syllables; as *heroicidad*, pronounced *a-ro-e-the-dad.*

The tilde ˜ is used over the *n* when this letter has the sound of *ni* in *union;* as, *daño.*

The acute accent ´ is placed over vowels, not to alter their sound, but to indicate the syllable on which the stress of voice is laid in pronouncing certain words; as, *órden.*

The circumflex accent ^ was formerly used over a vowel following *x*, when this letter had not its guttural sound; as, *sexo;* and over a vowel following *ch*, when the latter was pronounced as *k;* as, *chlo.* But the alterations in orthography no longer require this mark.

HINTS ON SPELLING.

SPELLING is word-making. You learnt something of this long ago from the spelling-book. Perhaps you are a good speller; but there are more than a hundred thousand words in the English language, and you cannot reasonably be expected to know the orthography of them all. No man or woman, however well educated, will venture to lay claim to perfection in this accomplishment. There is always something to learn. If we were at liberty to adopt and apply at once the phonetic system, in which every simple single sound is represented by a simple single sign, spelling would be no difficulty. Phonetic spelling is the natural system, but quite impracticable with our present alphabet. We must, under existing circumstances, spell as well as we can in the old way, for bad spelling is a great blemish in composition. We append the following nine rules, which it would be advisable to commit to memory—

1. Words of one syllable ending in *f, l*, or *s*, preceded by a single vowel, double the final consonant; as *staff, mill, pass;* except *of, as, gas, has, was, yes, is, his, this, us, thus.*

2. Words ending in any other consonant except *f, l*, and *s*, do not double the final letter; except *add, odd, ebb, egg, inn, err, purr, butt, buzz*, and some proper names.

3. Words of one syllable, and words accented on the last syllable, when they end with a single consonant, preceded by a single vowel, double the final consonant before an additional syllable beginning with a vowel; as *rob, robber; permit, permitting;* but *x* final, being equivalent to *ks*, is an exception, and is never doubled.

4. A final consonant, when not preceded by a single vowel, or when the accent is not on the last syllable, should remain single before an additional syllable; as *toil, toiling; visit, visited. L* and *s* are often doubled, in violation of this rule, when the accent is not on the last syllable; as *travel, traveller; bias, biassed.*

5. Primitive words ending in *ll* reject one *l* before *less* and *ly;* but words ending in any other double letter, preserve it double before these terminations; as *free, freely; careless, carelessness; odd, oddly.*

6. The final *e* of a primitive word is generally omitted before an additional termination beginning with a vowel; as *rate, ratable; force, forcible;* but words ending in *ce* and *ge* retain the *e* before *able* and *ous;* as *peace, peaceable; outrage, outrageous.*

7. The final *e* of a primitive word is generally retained before an additional termination beginning with a consonant; as *pale, paleness*; but when the *e* is preceded by a vowel, the formation is variable.

8. The final *y* of a primitive word, when preceded by a consonant, is changed into *i* before an additional termination; as *merry, merrily;* but before a vowel the *y* is not changed; as *valley, valleys*, and not *vallies*, as frequently written; and before *ing* the *y* is retained to prevent the doubling of the *i;* as *pity, pitying.*

9. Compounds generally retain the orthography of the simple words of which they are composed; as *all-wise, blue-eyed.*

ANSWERS TO CORRESPONDENTS.

A CORRESPONDENT requests us to insert the following:—"Would the subscribers of the POPULAR EDUCATOR, resident in or around Glasgow, correspond with J. Crawford, at T. Crawford's, 2, William-street, Greenhead, towards the erection of a mutual instruction class? and oblige, J. C. Glasgow, April 4th, 1864."

ELOCUTIONIST.—There is a wide difference between accent and emphasis. The former signifies the stress which is laid upon particular syllables in all compound words, and which may be easily and correctly acquired by the learner with the simple aid of a dictionary. *Emphasis* refers to words, and is more difficult of attainment, being the peculiar force with which we pronounce one or more words in a sentence, as dictated entirely by the general sense of the passage. Accent may be divided into two sections, the *major* and the *minor*, the *primary* and the *secondary.* For instance, though words of only two or three syllables have seldom more than one accented particle, yet, in the longer and more complicated words, it is often necessary to make use of a *double* accent, the more important syllable being accented in the *major*, the lesser in the *minor* key.

* The learner will now be able to pronounce the names of the Spanish letters of the alphabet, giving to each letter its true Spanish sound, according to the preceding directions:—*a, be, ce, che, de, e, efe, ge, ache, i, jota, ka, ele, elle, eme, ene, ñe, o, pe, cu, erre, ese, te, u, ve, equis, igriega, zeta.*

† The interrogation or exclamation mark coming first, being inverted.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LVII.

(*Continued from page* 52.)

ELECTRICITY.

Nature and History of Electricity.—Electricity is a powerful physical agent, the presence of which is manifested by attraction and repulsion, by luminous appearances, by violent commotions, by chemical decompositions, and many other phenomena. The causes which develop electricity are friction, pressure, chemical action, heat, magnetism, and electricity itself.

Six hundred years before the Christian era, Thales, the great Greek philosopher, already observed the property by which yellow amber on being subject to friction attracts light bodies. In speaking of this substance, Pliny says: "When friction has given it the warmth of life, it attracts pieces of straw as the magnet attracts iron." But beyond this, the knowledge of the ancients in relation to electricity did not extend. It was not till the close of the sixteenth century that Gilbert, the physician to Queen Elizabeth, again called the attention of philosophers to the properties of yellow amber, by showing that many other substances might, by friction, acquire the power of attraction. The philosophers who since the time of Gilbert have more particularly contributed to the advance of this science are, Otho de Guericke, Dufoy, Œpinus, Coulomb, Franklin, Volta, Davy, Ærsted, Ampere, Schweigger, Seebek, De la Rive, Faraday, and Becquerel, to the last of whom we are indebted for almost all we know of electrical chemistry.

In spite of the numerous works upon electricity, we do not know the nature or origin of this powerful agent. As in the cases of heat, light, and magnetism, philosophers are compelled to resort to mere hypothesis. Newton thought the production of electricity was the result of an ethereal principle put in motion by the vibration of the particles composing bodies. The abbé Nollet inferred from the luminous and calorific effects of electricity, that it is a particular modification of heat and light. Symmer acknowledged the existence of two electric fluids, Franklin of only one.

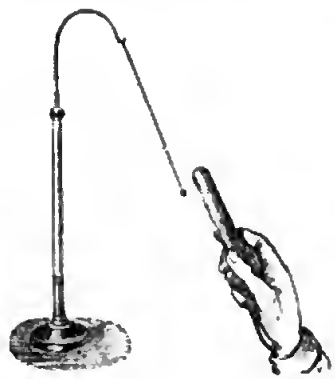
Statical and Dynamical Electricity.—Leaving all hypothesis out of consideration, the study of electricity is divided into two parts, the one comprehending the phenomena presented by *statical electricity*, or electricity in connexion with a state of rest, and the other those of *dynamical electricity*, or electricity in connexion with a state of motion. In a state of rest, electricity is chiefly produced by friction. It then accumulates at the surface of bodies, and is kept in equilibrium in a state of *tension*, which is manifested by attraction and sparks. In the dynamical state, electricity results principally from chemical action, and penetrates bodies under the form of a *current* with a rapidity like that of light. It is distinguished from statical electricity by chemical phenomena, and by its relations with magnetism. We shall first treat of statical electricity, considering more particularly that which is developed by friction, and we shall call a body *electrised*, when it possesses the property of attracting light bodies or producing luminous effects.

Development of Electricity by Friction.—Many substances on being rubbed with a piece of cloth or cat's skin, immediately acquire the property of attracting light bodies, such as the feathers of a quill or bits of straw. This property is particularly observable in yellow amber, sealing-wax, resin, sulphur, glass, silk, and many other substances. We ascertain that a body is electrised by means of small instruments called *electroscopes*, the most simple of which is the *electric pendulum*, fig. 378. This apparatus consists of a small pith ball hung by a silk thread to a support with glass feet. When an electrised body is brought near the ball, the latter is at first attracted, and then repelled immediately contact has taken place.

A solid body may also be electrised by friction with a liquid or gas. Friction does not always appear to develop electricity immediately. Some substances, particularly metals, may be rubbed for some time without any very perceptible effect, but still all substances are really electrised to some extent when placed in suitable conditions. The cause of the development of electricity by friction is unknown, though various theories have been propounded.

Conductors and Non-conductors.—On presenting a stick of sealing-wax which has been rubbed at one end to the electric pendulum, we find that only the part that has been rubbed exhibits any signs of attraction. It is the same with a glass tube and a stick of sulphur. Hence we conclude that the electric properties do not extend from one part of these bodies to another, which we express by saying that they do not *conduct* electricity, or are bad conductors of electricity. On the contrary, experience shows that directly a metallic body has acquired electric properties in one part it extends over the whole surface of the body, whatever may be its magnitude, that is to say, metals are *good conductors* of electricity. The best conductors are metals, anthracite or stone-coal, black-

Fig. 378.



lead, coke, charcoal from well calcined wood, pyrites, galena, and saline solutions—the conducting power of which last is many thousand times greater than that of metals—water in a state of vapour or liquid, the human body, vegetables, and all moist substances. The bad conductors are sulphur, resin, gum-lac, silk, glass, precious stones, charcoal not calcined, oils, and dry gases.

Isolating Bodies; Common Reservoir.—Bad conductors have received the name of *isolating bodies* or *isolators*, because they are employed as supports when we wish to make a conductor retain its electricity. This condition is indispensable, for the earth being composed of substances which conduct electricity, as soon as an electrised conductor comes into communication with it by means of another conductor, the electricity disappears in the earth, which on this account is called a *common reservoir*. A body is isolated by placing it upon glass legs, hanging it by silk cords, or placing it upon cakes of resin. But the worst conductors never completely isolate, the consequence of which is, that every electrised body always loses its electricity more or less slowly through the supports on which it rests. There is also a loss through the vapour in the atmosphere, which is usually the most operative cause of the loss of electricity.

It is owing to the great power of conduction possessed by metals, that electricity cannot be obtained from them by friction, unless care is taken to rub them with a non-conducting body, as silk, or taffeta. But if this precaution is attended to, the metals may be electrised very well by friction. To prove this, fasten a yellow copper tube into a glass handle, fig. 379,

Fig. 379.



and, holding this last in the hand, rub the metallic tube with a piece of silk or taffeta, and then, on bringing it near the electric pendulum, attraction will be observed, showing that the metal is electrised. If the metal is held in the hand, there will still be electricity, but it will be immediately lost in the earth.

Two kinds of Electricity.—We have seen that on putting a glass tube, which has been rubbed with a piece of cloth, near the electric pendulum, there is attraction at first, and after-

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wards repulsion immediately upon contact. The same effects are produced with a stick of sealing-wax rubbed in the same way. Hence it seems at first sight that the electricity developed in glass is the same as that developed in resin, but on pushing our investigations further, we find this is not the case. In fact, the glass tube and the stick of resin having been electrised as we have said, if, while the electric pendulum is repelled by the glass, we bring the resin near, this latter strongly attracts the ball of pith. In the same way, if to the pendulum, which is repelled by the resin immediately after contact, we present the glass tube, a strong attraction will be observed; that is to say, a body repelled by the electricity of the glass is attracted by the electricity of the resin, and reciprocally, a body repelled by the electricity of the resin is attracted by that of the glass. Upon the ground of these facts Dufay, a French philosopher, in 1734 first asserted the existence of two kinds of electricity of different character; the one that which is developed in glass on being rubbed with wool, the other in resin or sealing-wax on rubbing them with a piece of cloth or cat's skin. The former is called *vitreous electricity*, the latter *resinous electricity*.

Theories of Symmer and Franklin.—To explain the contrary effects presented by these two kinds of electricity, Symmer, an English philosopher, maintained the existence of two electric fluids, each repelling itself and attracting the other. According to this philosopher, these fluids exist in a state of combination in all bodies, and thus constitute what is called the neutral or natural fluid. Various causes, especially friction and chemical action, suffice to separate them, and then electric phenomena appear; but these fluids have a strong tendency to reunite and form neutral fluid again.

The two electric fluids are called the vitreous and the resinous fluid. They are also called the positive and negative fluid, expressions borrowed from Franklin's theory. This philosopher, who acknowledged only one fluid repelling its own molecules and attracting those of material substances, considered that all bodies contain a determinate quantity of this fluid in a latent state. When it increases, the bodies are electrised *positively*, and possess the properties of vitreous electricity; when it diminishes, the bodies are electrised negatively, and possess the properties of resinous electricity. The term *positive electricity* or *positive fluid* are consequently equivalent to *vitreous electricity*, and *negative electricity* or *negative fluid* is equivalent to *resinous electricity*. Positive electricity is represented by the sign + (plus), as in Algebra, and negative electricity by — (minus). Symmer's theory affords a simple explanation of many phenomena, and is therefore generally admitted in schools of science, at least in France. But it should not be forgotten that it is after all only an hypothesis. Besides, there is some vagueness about the term *fluid* as applied to the causes of heat, light, magnetism, and electricity. In fact, we may ask what is a fluid? and what is its nature?—questions which no philosopher has yet satisfactorily answered.

We can only regard the hypothesis of two electric fluids as expressing two states in which electricity presents itself, under the aspect of two equal and contrary forces tending to produce equilibrium. The German philosophers generally acknowledge only one electric fluid.

Action of Electrised Bodies upon one another.—Admitting the hypothesis of two kinds of electricity, the effects of attraction and repulsion which electrised bodies present are comprised in the enunciation of the following principle, which serves as a basis for the theory of all the phenomena presented by statical electricity:—

Two bodies charged with the same electricity repel, and two bodies charged with contrary electricity attract each other.

Law of Electrisation by Friction.—When two bodies of whatever nature are rubbed together, the neutral fluid of each is decomposed, and in all cases *one of the bodies takes the positive, and the other the negative fluid.* To prove this, communicate to the electric pendulum a known electricity, and bring the two bodies near it one after the other, taking care to isolate them if they are conductors. Then one of the two will attract and the other repel the pith ball, which proves that they are charged with contrary electricity. Further, they are also charged with an equal quantity of each, for if we bring them near the pendulum while they are in contact, there is neither attraction nor repulsion, which shows that the two kinds of electricity are in equilibrium. These experiments are generally made with glass discs, which are rubbed together briskly and then suddenly separated.

The electricity developed in a body by friction varies with the nature of the body rubbed. Ground glass rubbed with wool is electrised positively; glass not ground, on the contrary, when rubbed in the same way, is electrised negatively. The species of electrity developed depends upon the nature of the substance used in rubbing. The following substances are electrised positively when rubbed by those which come after them, and negatively when rubbed by those that precede them: cat's skin, ground glass, wool, feather, wood, paper, silk, gum lac, unground glass. The kind of electricity developed by friction also depends upon the degree of polish, the direction of the friction, and the temperature. If we rub together two pieces of glass one of which is more ground than the other, the former acquires positive and the latter negative electricity. If a piece of white silk riband be rubbed crosswise against another, the former is electrised positively and the latter negatively. If two substances of the same kind but of different temperatures be rubbed together, that which has the higher temperature is electrised negatively. In general it is bodies whose particles are easily moved that are most easily electrised negatively.

Development of Electricity by Pressure and Splitting.—Œpinus first established the development of electricity by pressure. Libes afterwards showed that by lightly pressing a metal disc, isolated by a glass handle, upon a wooden disc covered with gummed taffetas, the metal disc becomes electrised negatively. Having demonstrated that Iceland spar is electrised positively on being pressed for a short time between the fingers, and that this crystal retains the electricity for several days, he discovered the same property in several mineral species, but M. Becquerel found that it belonged to all bodies, even conductors, provided they be isolated. Cork and india-rubber pressed against each other acquire electricity, the first positive and the second negative. M. Becquerel also observed that splitting, or the natural division of crystallised substances, may be a source of electricity. On splitting a piece of mica quickly in the dark, a feeble phosphoric light is observed. To prove that this phenomenon arises from electricity, M. Becquerel fastened each piece to a glass handle before separating them. He then suddenly separated them, and presented them to the electric pendulum, and found they possessed contrary electricity. Talc in plates, and all bad conductors, are thus electrified by splitting. In general, whenever two particles are separated, each acquires a contrary electricity, unless the body to which they belong be a good conductor, for in that case the separation cannot be rapid enough to prevent the reunion of the two electricities. It is to the phenomena we have just described that we must refer the light which sugar gives out when broken in the dark.

MEASURE OF ELECTRIC FORCES.

Law of Electric Attraction and Repulsion.—The mutual action that takes place between electrised bodies is subject to the following two laws:—

1. *The repulsion and attraction between two electrised bodies are inversely as the square of the distance.*

2. *These forces are directly in proportion to the quantity of electricity in the two bodies.*

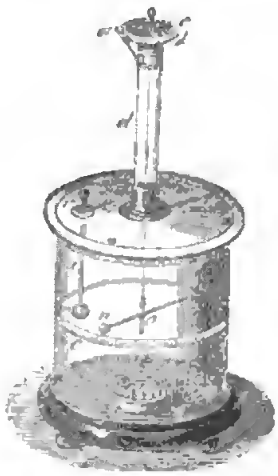
First Law.—These two laws were demonstrated by Coulomb by means of the torsion balance, which, as we have seen, is employed to demonstrate the laws of magnetic attraction and repulsion. The only modification necessary to be made in the balance in this case is, that instead of the magnetised needle suspended by the metallic thread, a stick of gum lac, with a small tinsel disc *n* at the end, fig. 380, is used, and instead of the vertical magnetised needle, a glass tube *s* with a copper ball *m* at the end. Fig. 380 exhibits several other modifications of fig. 382, but they are not necessary. For instance, the box is cylindrical instead of rectangular, the graduations are made round the sides of the box instead of at the bottom, and the micrometer is composed of a graduated disc *e*, which is moveable independently of the tube *d*, and of an index *a*, which is fixed and serves to indicate through how many degrees

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tho disc *c* is turned. In the centre of this last disc is a small button which turns with it, and tho extremity of which presses the end of the metallic wire that supports tho needle *s m*.

To demonstrate tho first of the above laws, first dry the air in the apparatus in order to diminish the loss of electricity, which is effected by placing in tho box a small cup full of quick lime, and leaving it there for several days. When the air is completely dried and the zero point of the micrometer coincides with the index *a*, turn the moveable tube *d* till the needle

Fig. 380.



o n is directed to the zero point of the graduated circle *c*, a position to which the ball *m* corresponds when it is in the box. Then withdrawing the ball, taking care to hold it by the insulating tube *i*, electrify it by bringing it in contact with some source of electricity, as *e.g.* an electrical machine, and then put it back into tho box through an opening *r* in the cover. Tho disc *n* is immediately attracted, and then being electrised on contact with tho ball, it is repelled, and after some oscillations it stops, when the torsion of tha thread is in equilibrium with tho repulsive force between tho disc and the ball. Suppose tha torsion indicated by tho needle on the graduated circle *c*, to be 20 degrees, then the torsion being proportional to the force of torsion, this number 20 may he regarded as representing the electric repulsion at the distance at which the needle is placed. To measure this force at a less distance, turn tho disc *c* in the direction of the arrow till tho distance of the tinsel *n* from tho ball *m* is only 10 degrees, or one-half what it was before. Now to bring the needle to this point, it is found necessary to turn tho disc through 70 degrees. Therefore the metallic wire is twisted at its upper extremity 70 degrees in tho direction of tho arrow, and 10 degrees in a contrary direction at its lower extremity. Consequently, the two torsions together make a total of 80 degrees, that is to say, four times what corresponds to a double distance. Besides, the force of torsion being always equal and opposite to the repulsion, this last must also be four times as great as for a distance half as great. In the same way it may be shown that for a distance of a third, tho repulsion is nine times as great, which proves tho law for repulsion. That of attraction may be established by tho same method, but it is necessary to give tho ball and tho disc contrary electricities.

The Second Law.—To demonstrate that tha electric forces are directly proportional to tho quantity of electricity in bodies, electrify the copper ball *m*, then, noting tho repulsion acting on the needle *o n*, remove the ball *m*, and touch it with a copper ball of the same diameter in a neutral state, and isolated by means of a glass handle. Tho ball *m* then gives up half its electricity to the other, since the surfaces of tho two balls are equal, as will be explained presently. Now on returning the first ball to the box, we find that the repulsion is only half what it was at first. If we again take from the ball *m* the remaining half of the electricity, the repulsion is only one-fourth of the original repulsion, and so on continually; which demonstrates the law. In these experiments, we take the arc which measures the torsion as the interval between the electrised bodies, that is to say, we take the arcs for their chords, which is only an approximation, but the error does not sensibly effect the results, the arcs being very small.

Electricity comes to the Surface of Bodies.—When an isolated body, of whatever form you choose, is electrised, whether positively or negatively, the electric fluid comes to the surface, where it forms a layer of infinite tenuity. This accumulation of all the electricity at tha surface, was demonstrated by Coulomb by means of the two following experiments.

1. Take a hollow copper sphere isolated by a glass stand, and having in its upper part a circular opening, fig. 381. After

Fig. 381.



having electrified it by putting in contact with an electric source, touch first the inside and then the outside with a *proof plane*, *i. e.* a stick of gum lac with a metallic disc at tha end to collect the electricity. Now on touching tha inside of the electrified sphere with the proof plane, no electricity is collected, for on the plane being placed near the needle *o n*, in the torsion balance of Coulomb, fig. 380, neither attraction nor repulsion is observable. But if the plane touch the outer surface of the sphere it is electrised, for on being brought to tha balance there is attraction; consequently there is no free electricity except on the outer surface of the sphere.

2. Take a sphere charged with electricity, isolated like that in fig. 381, and two hollow copper hemispheres of the same diameter as the sphere, and capable of covering it and being quickly removed by means of glass handles. After having electrised the sphere, place the two hemispheres (holding them with glass handles) over the sphere, and then withdraw them both together quickly. You will then observe that they are both electrised, but that the sphere has retained no trace of electricity: therefore the fluid communicated to the sphere was entirely at its surface, since it was completely removed as soon as the two enveloping hemispheres touched it. The tendency of electricity to escape from bodies is called *tension*.

Influence of the Form of Bodies on the Accumulation of Electricity.—On a metallic sphere the thickness of the electric layer is the same for all points of the surface. It is evident, in fact, that it must be so from the symmetrical form of the sphere. It is proved by means of the torsion balance and the proof plane. For this purpose, electrise an isolated sphere like that represented in fig. 381, and, after touching several points in succession with the proof plane, bring the latter near the needle of the balance. Tho same torsion will be observed in each case, which shows that the proof plane has at every point received the same quantity of electricity.

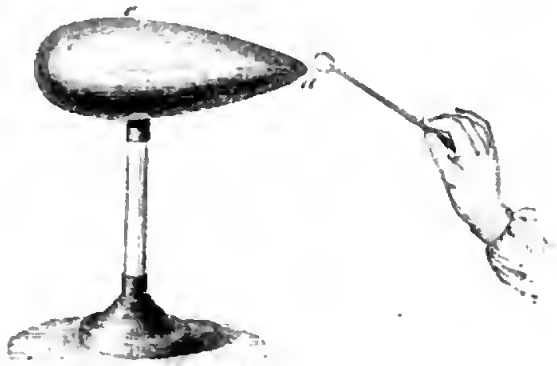
If the electrified body is an elongated ellipsoid, fig. 382, the thickness of the electric layer ceases to be uniform, the electric fluid, always acted upon by its own repulsion, accumulates towards the most pointed parts where the electricity is conse-

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qnently thickest. To prove this, touch the ellipsoid with the proof plane in different points, and on applying the proof plane to the torsion balance, it will be found that the maximum of torsion is produced when the extremity *a* of the ellipsoid is touched, and the minimum when the part *e* is touched.

Distribution and Communication of Electricity to Bodies in Contact.—By the aid of the proof plane and the torsion balance. Coulomb made many experiments on the distribution of electricity over the surface of bodies in contact. With metallic spheres, isolated, put in contact, and electrised in this state, he found that the electric fluid is differently distributed over their surfaces, according to the ratio of their diameters. If these are equal, the thickness of the electric fluid is nothing

Fig. 382



at the point of contact, and does not become perceptible till at 20 degrees from that point. It increases rapidly from 20° to 30°, more slowly from 60° to 90°, and continues nearly the same from 90° to 180°. When the diameters are in the ratio of two to one, the thickness of electricity, which is nothing at the point of contact, is at first more considerable in the larger sphere, but it then increases more rapidly on the smaller, and at 180° from the point of contact, the smaller has the greatest thickness of electricity.

Loss of Electricity in Air.—Electrised bodies, though isolated, always lose their electricity more or less rapidly. This loss results from two causes. 1. The conducting property of the air and vapours which surround the bodies. 2. The conducting property of the isolating supports employed. The loss by the air varies with the electric tension, the renewal of the air, and its state of moisture. Dry air is a bad conductor of electricity, but if it is moist, its conducting power is in proportion to the quantity of vapour it contains. Coulomb showed that, in a calm atmosphere and a constant degree of moisture, the loss in a very short time is proportional to the tension—a law analogous to that of Newton on cooling. To diminish the loss of electricity by isolating supports, they should be kept carefully dry, and made as long as possible.

Loss of Electricity in Vacuo.—Electricity being retained at the surface of bodies through the bad conducting property of the air, when this latter is rarefied, the loss increases, and in a vacuo all the electricity is lost—at least, such is the theoretical result, though experiment does not altogether confirm it.

LESSONS IN MORAL SCIENCE—No. V.

MAN'S DIRECTION AND GOVERNMENT OF HIS ACTIONS, AND HIS CONSEQUENT RESPONSIBILITY.

THERE are two extremes to be avoided here. The first is that which considers man as, in some sense, a passive recipient of influences from without. He is represented as placed in certain circumstances and surrounded by certain objects, in the selection of which he has had no choice; and as he is susceptible of certain impressions which these circumstances and objects are fitted to make upon him, he cannot be considered a free and accountable agent.

In opposition to this false hypothesis we assert that the whole force which governs man is within, and proceeds from himself. External objects are in themselves inert. They exert no influence; no power emanates from them. The only power and influence which they can possibly have over any man they derive from the active principles of his nature. We are, indeed, accustomed in popular language to say that external objects excite and inflame the mind; but in philosophical accuracy they are but the passive objects on which the affections and desires of the mind fasten, and their whole power of moving to action depends upon the strength of the inward affections of the soul. To render this perfectly plain to every mind, it will only be necessary to attend to a few familiar illustrations.

To a man who is under the influence of hunger or thirst, bread and water are said, when seen, greatly to excite him, so that he is strongly impelled to appropriate these objects to the craving wants of his nature. But every one sees at once that both the bread and the water are merely passive objects on which the appetite fixes. The real force which impels to action is not, therefore, the external object, but the inward desire which is in the soul itself. For where no appetite of hunger or thirst exists, the bread and water, however presented and urged upon the sense, produce no effect; there is no motive to action experienced.

Take another case. A man comes into a room where lies a pile of gold. Avarice urges him to seize the beloved object, and appropriate it to himself. Two desires or motives counteract the tendency of avarice; one is a sense of duty or regard to the dictate of conscience, which he knows ought to be obeyed; the other is a regard to reputation, or the good opinion of men. Between these two antagonistical principles, there must of course be a conflict. If avarice be strong, and the power of conscience and desire of the good opinion of men be comparatively weak, the consequence will be that the man will put forth his hand and take the gold, and at the same time will feel conscious that he is doing wrong. But if conscience be fully awake, and especially if a love of moral excellence and a hatred of iniquity have a place in his mind, this motive alone will be sufficient to induce him to reject at once the thought of appropriating what belongs to another. In this case it is evident that the gold on the table is altogether passive; there is no secret emanation from the inert metal. The whole power of gold to seduce the mind to evil depends on the strength of the principle of avarice within; and in a mind rightly constituted, or under the influence of good moral dispositions, it could never so prevail as to induce the person to do an unlawful act for the sake of obtaining it.

From these cases it is evident that a man is not governed by any influence from without or separate from himself, but that the true spring of his actions lies entirely in his own inclinations and will, external things have no other influence than as they furnish objects suited to his appetites and other desires.

Some writers on the will, in speaking of the governing power of motives, have expressed themselves in a manner which leads to the opinion that the motives by which the will is determined exist without us, or separate from ourselves, whereas those motives which possess an active power and govern our voluntary actions, are within us, and are our own active powers and affections, for which we are as responsible as for any other acts or operations of the mind. Hence it may truly be affirmed that every man possesses a self-determining power, by which he regulates and governs his own actions according to his own inclinations.

The other extreme in regard to this subject is, that the will possesses a self-determining power in itself, independent of all motives, and uninfluenced by any inclination. And it is maintained that such a self-determining power is essential to freedom, and to the existence of an accountable moral agent. If, indeed, this last opinion were correct we should admit the self-determining power of the will, whether we understood its nature or not; for we lay it down as a first principle—from which we can no more depart than from the consciousness of existence—that MAN IS FREE; and therefore stand ready to embrace whatever is fairly included in the definition of freedom. But it is not yet made evident, or even probable, that

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such a power exists, or that it is at all necessary to free moral agency, or that the possession of such a power would be valuable or desirable.

All that is wanted is, to make the man the master of his own actions, and this is completely effected by giving him the power to will and to act in accordance with his own inclinations. Certainly a man is not the less accountable for his actions because they are in accordance with his desires. Every rational being acts with a view to some end, and his regard or affection for that end is the motive which governs his will and influences his conduct.

It cannot justly be denied, and is generally admitted, that in most cases the determinations of the will are influenced by strong desires; and when such desires exist, and there are none leading in a contrary way, the decisions of the will are in fact determined by the previous state of the mind. Now if the prevalence of these desires in such cases is not found to interfere with free agency, there is no reason to think that the belief that the will is invariably determined by the strongest existing desire will lead to any conclusion unfavourable to liberty. If the self-determining power in question is exerted only in trivial cases where motives to action are weak, or when there is an equipoise of motives, it cannot be a power of any great consequence, since most of our moral acts are performed without its aid.

Let us first take an impartial view of the acts of a man in the exercise of the power which all admit he possesses, and then of this imaginary power which some think essential to moral agency.

In the first case the man exercising his reason, apprehends objects which appear to him, on some account, good and desirable. These objects he desires to obtain, and puts forth those volitions which produce the actions requisite to the accomplishment of his object.

In the second case the man feels an inclination leading him with more or less force to a certain object; but he has a power which he can at any time exert to arrest his action in the line of his inclinations, and by exerting this power of willing he can counteract any desire, and act in opposition to it. Or if two desires exist, he can by this power give the prevalence to that which is the weaker. The best way to bring this matter to the test of experience is to suppose a case in which such a power is exerted. Suppose the case of a man in whom, by habit and indulgence, the appetite for intoxicating drink is strong; but he is induced by weighty reasons derived from a sense of duty and a regard to his health, reputation, family, and temporal prosperity, to determine not to expose himself to temptation. An old companion calls and solicits him to go with him to a convivial meeting. His appetite strongly pleads for indulgence, if only for this one time; but conscience remonstrates, and a regard to health, reputation, and the like, operates strongly on the other side. Suppose the influence felt from these two opposite sources to be almost equally balanced; suppose even a perfect equipoise. Such a state of mind, though possible and frequently experienced, can never last long, for the states of the mind change in some respects every moment, and the least difference in the views of the subject would destroy the balance. But now is the time for the exercise of the power which determines without regard to motive. Suppose, while the scales are thus in equipoise, this power to be exerted, and the man determines in favour of self-denial. Why he did thus determine, seems to be a reasonable inquiry; but if this power exists, such a question is entirely irrelative. There was, according to the supposition, no reason or motive which influenced the determination. Here then is a case for our consideration: Is an action prompted by no motive, and performed without a view to any end, an accountable moral act? If this self-determining power exists, it may be exerted in opposition to the highest and best motives, and neither the person himself nor any body else can tell why it was exerted. If a man under the influence of love to his Creator, should be about to engage in the performance of some plain and important duty, the exertion of this power at the most unseasonable time might arrest his action and lead him to a contrary determination. Why would he exert such a power at such a time? That, indeed, is the question. But if any reason of any kind could be given it would destroy the hypothesis, which is that a man has power to determine in opposition to all existing motives, and where there is a competition can act in conformity with the weakest. Surely such a power is irrational and dangerous in the extreme, and has no tendency to increase that freedom which is requisite to a moral agent.

OBJECTIONS TO THE UNIFORM INFLUENCE OF MOTIVES.

One of the most plausible objections to the uniform influence of motives on the will is, the intimate conviction every man has, when he has done what he regrets, that he could have done otherwise; whereas, upon the hypothesis laid down above, the man could not possibly, with the same motives, have acted differently from what he did. And it is alleged that no man ever would or could repent of his most criminal conduct, were he persuaded that he could not have willed and acted differently from what he did.

This objection brings out the true issue in this inquiry. The real question in dispute in regard to the will is, whether, all things external and internal being the same to any voluntary agent, the volitions will be the same. That is, whether a man in the same state of mind and under the influence of the same desires and motives, in kind and degree, will not always will and act in the same way. This we affirm; and the advocates of the self-determining power of the will, deny.

It is admitted that when a man has done wrong and is convinced of his error, he is deeply conscious that he might and should have acted differently. But when this conviction is analysed, it is found to be, not that he might have willed and acted differently with the same feelings that influenced him at the moment of doing wrong, but that he might and should have had a different state of feeling, or a more considerate attention to those things which were forgotten, but which if recollected would have prevented him from doing that which he now regrets.

Take a case. A man in an hour of levity, and under the influence of a degree of envy, speaks disrespectfully of a person whose character is worthy of esteem, and to whom he is under special obligation. Upon reflection he is truly sorry for what he said, candidly confesses his fault, and says that were he again placed in similar circumstances, he would not be guilty of the same fault. But suppose he should be asked whether, if the same degree of inattention, and the same envious feeling should again exist which characterised the state of his mind when he spoke unadvisedly, and no considerations should occur which were not then present to his mind, he is of opinion that he would act differently from what he did? Under such a view of the matter, few persons dare profess that they would act differently when placed in precisely the same circumstances. When we feel that we would and could act differently from what we have done in certain and specified circumstances, it is always on the supposition that our views and feelings should be different. If the person speaking disrespectfully of a friend is asked what would induce him to act differently, if the thing were to be done again, the natural and reasonable answer is, "I should think of the impropriety of the thing, and should recollect my obligations to the person; and other the like considerations." This shows that men feel accountable, not only for their volitions and actions, but for the views and feelings which precede volition. Indeed if there is one point above all others on which responsibility rests, it is on the motive, that is, the active desires or affections of the mind from which volition proceeds, and by which it is governed. The murderer could easily abstain from murder, if he would repress his malignant feelings; but with the same spirit of malice and revenge which induced him to shed his brother's blood, and with the same absence of all other views and feelings than those which he had at the time, there is a moral certainty that he would commit the same crime again. Nor has this certainty, that unrestrained malice and revenge would again lead to the perpetration of the same horrid crime, the slightest tendency to alleviate the guilt of the murderer. The true ground of his culpability lies in his having and indulging such malignant tempers, and in voluntarily turning away his mind from all considerations of piety and humanity, which would restrain him from the cruel act. And here a question might arise

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respecting a man's desires and affections, and the power which he has over them; but this is not the proper place for a discussion of that point.

Another objection which has been repeatedly urged, and which by many is considered unanswerable, is, that according to this hypothesis, when two things exactly equal, and viewed to be so, are presented to the choice of a rational being, it would be impossible to choose either. But every man (says the objectors) feels that he has the power, if two loaves of bread or two eggs exactly alike be presented, of choosing between them; and as there exists confessedly no motive for preferring one loaf or one egg to the other, therefore it is possible for the will to determine without a motive.

To this plausible objection it may be answered, that if the self-determining power of the will, independently of motives, be confined to cases in which there are no motives to turn the balance, it is a power of very little importance, and not worth disputing about. Let it be admitted that in such an equipoise of motives, the mind can determine in favour of either of the objects. But perhaps this will admit of a different solution, and one in accordance with the theory maintained. And let it be remarked, that it is not the similarity of external objects which should here be considered, but the view which the mind takes of them. We know how a fertile imagination may cast a grain into one of the balanced scales, and cause it to preponderate. But further, the state of mind supposed to be produced by objects of equal value is really felt for a moment. Between two things we hesitate, not being able to come to a decision; but this indecision arises not from a belief that the objects proposed are equal, but from a doubt which is preferable. When we are sure there is no difference, this hesitation is not experienced. The explanation which seems correct is the following: two guineas are laid before a poor man, and he is told to take which one he pleases. It cannot be necessary that he should think one better than the other. If such a preference were necessary, he would be unable to take either, and his situation would be comparable to the ass of the old Greek sophists, held immovable between two bundles of hay.

The difficulty supposed to exist in the case of two equal objects proposed for our choice, is perfectly imaginary; no difficulty or perplexity is ever experienced, when the things presented to our choice are known to be equal. It is only when we apprehend that there may be a difference between the objects offered that we hesitate. As if a person should offer to our choice two caskets, the contents of which are unknown; we find it difficult to choose, for the very reason that we suspect the one to be more valuable than the other, but are ignorant to which the greatest value attaches. And if we should be informed that one contained jewels of great price and the other nothing but baubles, our hesitancy would be accompanied with solicitude. But when we are certain that the things proposed to our choice are perfectly alike, in all respects, we experience no difficulty whatever. Suppose it to be first a single guinea which is offered to a needy beggar; he is moved by his feeling of want to take it. If instead of one, two guineas are offered, he experiences no difficulty in choosing, knowing them to be alike. But this furnishes no example of an action produced without a motive. The question is, whether the man shall act or not; and the motive for action is strong, namely, the desire of relief. As he is at liberty to take but one, and there is no difference between them, he seizes that, which from one or more of a thousand slight reasons of nearness or convenience, it happens to him to choose, without any preference properly so called.

SUMMARY VIEW OF LIBERTY.

Man is conscious of liberty, and nothing can add to the certainty which he has, that he is a free agent. Objections to self-evident principles, however plausible, should not be regarded; for, in the nature of things, no reasonings can overthrow plain intuitive truths, as no reasonings can be founded on principles more certain. Though we may not be able to understand or explain with precision wherein freedom consists, yet this ignorance of its nature should not disturb our minds. We experience the same difficulty in regard to other truths of this class without any diminution of our assurance. We are conscious that we have a life—but what is life? neither we nor any other human being can tell. But do we, because of this ignorance, doubt whether indeed we live? Not in the least. We know that we are free precisely in the same manner that we know that we are living beings, and no plausible reasonings should disturb us in the one case more than in the other.

Again, if in attempting to explain what is essential to free agency, we should fall into any mistake, or conclude that something does not belong to it, which does, let it not be said that we deny the freedom of man; for while we may err in regard to our conception of its nature, we know that we cannot err in regard to the actual existence of freedom.

We are willing to attribute to man every kind and degree of liberty which can properly belong to a dependent creature and a rational being; and if we deny what some think essential to free agency, it is because in our view it would be no real privilege to possess such a power, as not being compatible with the laws by which rational creatures are governed.

It is admitted that man has power to govern his own volitions, and does govern them, according to his own desire. He has the liberty, within the limits of his power, to act as he pleases; and greater liberty, in our judgment, is inconceivable.

To suppose, in addition to this, a power to act independently of all reasons and motives, would be to confer on him a power for the exercise of which he could never be accountable. It would be a faculty which would completely disqualify him from being the subject of moral government. In the nature of things, it would be impossible that a creature possessed of such a power could be so governed that his actions could be directed to any end.

One hypothesis makes man the master of his own actions, still a creature governed by understanding and choice. He may be misled by false appearances, and influenced by wrong motives, but is always governed by some reasons or motives.

On the other hypothesis, a man may and does act without any inducement, and without being influenced by any reasons, to do what is contrary to all his inclinations and feeling. We cannot but think that, after all, the abettors of this scheme retain in their minds a certain obscure but lingering persuasion that the free agent feels some reason for acting as he does; and if so, the dispute is at an end, for whatever may be the consideration which induces a man to act in opposition to strong desire, it must be something which is felt by the mind to have force, and to be such a consideration as ought to influence a rational being.

Let us for still further elucidation again suppose a case in which this self-determining power is exerted.

A young man entrusted with the property of his employer, has by undue indulgence in amusements contracted debts which he is unable to pay. He sees a way by which he can appropriate to his own use some of the money in his hands without the possibility of discovery. His wants are urgent, his reputation is at stake, and he feels himself impelled by a powerful motive to the deed; and there are no motives to draw him in an opposite course but such as are derived from conscience and the fear of God. At the moment when about to perpetrate the felonious act, he pauses and resolves that he will not do it. The question is, has he not power to act thus? Is he not the arbiter of his own acts of will? Are we not all conscious that we possess such a power? There is no dispute about the power, if it only pleases the agent to exercise it. He is as free to abstain from embezzling what belongs to another, as to do it. The only question is, will he do it unless some reason, motive, or moral feeling influence him? If so, then indeed it would be the exemplification of the power in question. But when we examine the case carefully, we shall be satisfied that where there is a powerful motive on one side, there must be a preponderating motive on the other to prevent a volition in accordance with the first. Suppose the young man under the temptation mentioned to have his mind free from all moral considerations, and to have no fear of injuring his reputation, what would restrain him? Or, if without any moral influence, or any other consideration, he should abstain, would there be any virtue in the act? To know whether an act is virtuous, we properly ask, why was it done? what was the motive of the agent? But here there is none, and consequently the act can have no moral character. And if we suppose some faint remonstrance of conscience and

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some slight fear of discovery, even these would not prevent the act where the contrary motives were urgent.

But suppose, now, this young man to have had a religious education, and to have been brought up to regard his reputation, and when the temptation is most powerful and he is in danger of yielding, conscience should utter her voice with power, and dictate imperatively that this is a deed which should not be done; and at the same time, a lively apprehension of disgrace should operate with a combined influence on his mind, would the operation of these motives in preventing the crime be less rational or less virtuous than if he should act without a motive?

LESSONS IN GREEK.—No. LI.

By John R. Baird, D.D.

The Voices of the Verb.

The subject is most intimately connected with the verb. How intimately the subject is connected with the verb may be inferred from the fact, that so far as the unemphatic pronoun is considered, the subject and the verb bleod together and become one word. The subject, indeed, is the vehicle of the action of the verb. The verb declares something, and that something is declared of the subject, which is thus seen to be the medium or channel for conveying the statement made by the verb. In the verb action appears, not in an abstract form, but a concrete form, that is, as limited to the particular subject employed. Only in the infinitive mood is an abstract affirmation made.

From the subject of the affirmation we, therefore, naturally pass to that which is affirmed, for every affirmation consists of two parts, namely, what is said, and the person or thing of which it is said. Thus, *I eat*, is an affirmation, and into this affirmation two elements enter, namely, *I*, the subject, and *eat*, the verb. Now, in considering the verb of a simple sentence, we must ask how a verb may be modified, or under what forms it may appear. If we consider the subject as merely the channel of the affirmation, we have the verb in what is called the active voice. If we consider the subject as re-acted upon, we find that such reflex action may take place in two ways, either with an object or without an object. If the reflex action takes place with an object, then the verb is said to be in the passive voice. If the reflex action takes place without an object, then the verb is said to be in the middle voice. I put together examples of the

Three Voices of the Verb.

Active—The subject conveys the action	ὁ παῖς τυπτει *the boy strikes.*
Passive—The subject receives the action from an object	ὁ παῖς τυπτεται ὑπο του πατρος the boy is struck *by his father.*
Middle—The subject acts on itself	ὁ παῖς τυπτεται the boy *strikes himself.*

The student is prepared to find, as here, the form for the passive the same as the form for the middle voice of the present tense. The simple fact is, that the Greek verb is richer in meaning than it is in form, though in form it is very rich.

The voices of the Greek verb bring under our consideration, the verb in regard to its kinds or sorts. Viewed in the relations which it bears to its subject, the Greek verb is of three kinds, or has three voices—*the active, the passive, the middle.*

But every affirmation has respect to time—the time when the declared fact took place. But time is grammatically expressed by *tense*. Accordingly we must consider the Greek verb in its *tenses*.

Further, declarations or affirmations may be made in different ways. I may declare a fact simply and independently, and I may declare one fact in relation to another. Hence the manner in which affirmations are made demands attention, and so we are led to study the verb in its *moods*.

Three points, then, have to be studied—the voices of the verb, the tenses of the verb, the moods of the verb. First—

The kinds or Voices of the Verb.

The active voice has two modifications and may appear as either transitive or intransitive; *e.g.*

Active transitive	ὁ	παῖς	τυπτει	(τον	ἀδελφον)
	the	boy	*strikes*	(*his*	*brother*).
Active intransitive	ὁ	παῖς	τρεχει		
	the	boy	*runs.*		

In the first instance the verb is transitive as well as active, because the action passes from the subject to an object. In the second instance the verb is intransitive, since it has no object, but the action limits itself to the subject; the forms of the verbs show that they are both in the active voice.

Generally every verb has either a transitive or an intransitive signification. But many verbs combine the two meanings, being sometimes transitive and sometimes intransitive. When the two imports unite in one verb, either the two run through all the forms, or they are limited, so that one signification belongs to this form, the other signification belongs to that form. In treating of the forms of the verb we have given an abundance of instances.

Of the verbs, however, in which the two, namely, the transitive and the intransitive import, run through all the tenses; take as examples, ἐχειν, *to hold*; ἁρματτειν, *to adapt*; κλινειν, *to lean*; στρεφειν, *to turn*; ὁρμᾶν, *to set in motion*; τεινειν, *to stretch*; and πραττειν, *to do.*

Many transitive verbs become intransitive by combination with prepositions, as προσκρουειν, *to dash against*; ἀπαλλαττειν, *to depart*; μεταβαλλειν, *to change*; προσβαλλειν, *to add to*; ἐπιδιδοναι, *to increase*; συμμιγνυναι, *to mingle.*

Many verbs which have only a transitive meaning become intransitive by the omission of an easily understood object; *e.g.*—τελευτᾶν (scil. τον βιον), *to end* (life), *to die*; ἐκβαλλειν and ἐξιεναι (scil. το ὑδωρ), *to flow out, fall into*; so with την στρατιαν understood, *to invade*; ἐλαυνειν with το ἁρμα (*a chariot*), τον ἱππον (*a horse*), understood, *to march, to advance*; προσεχειν, understanding τον νουν or την γνωμην, *to attend to*, literally, *to apply* (one's mind) *to.*

The ensuing are the forms to which the intransitive meaning chiefly belongs; namely, the second perfect and its derivative the second pluperfect, which are intransitive not merely in the verbs which in the present have both significations, but also in other verbs which in the other tenses are employed only transitively. Of the first kind take as examples, πεπραγα, *I have found myself, I am*; πεφηνα, *I have appeared, I prove*; ανεῳγα, *I am open*; εαγα, *I am broken.* As examples of the second sort take—εγρηγορα, *I am awakened, I watch*; μεμηνα, *I rage*; ῥῥωγα, *I am broken, torn*; πεποιθα, *I trust*; πεπηγα, *I am fastened, I am firm*; σεσηπα, *I am rotten*; τετηκα, *I am melted.*

The intransitive import attaches also to the second aorist, the perfect and the pluperfect of ἱστημι, *I place*; ὄνυμι, *I enclose*; φυω, *I beget*; which in the tenses mentioned signify *I stand, I enter, I arise.*

If, with intransitive verbs, the object is named by which the condition expressed in the verb is occasioned, then, as in the passive, that object is put in the genitive with the preposition ὑπο; as

Intrans., with an object πολλα κακα επαθομεν ὑπο των λῃστων
we have *suffered* many things *from robbers.*

In the passive voice the object is in the genitive with ὑπο, as

Passive, with an object Ἕκτωρ ἀποκτεινεται ὑπο του Ἀχιλλεως
Hector *is slain by Achilles.*

By ὑπο (Lat. *sub*), which signifies *under*, the subject is represented as suffering or *undergoing* something at the hands of the object, as if the subject were locally under that object. If, instead of this relation, you intend merely to mention the occasion through which an influence is exerted, then you

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employ either εκ, *out of*, or απο, *from*—both with the genitive, as denoting the source or origin of any thing. Sometimes, when the writer means *on the part of*, προς, with the genitive, is employed, if the subject is of a personal kind. Παρα also with the same case may be used when the idea of place is involved; παρα thus denotes, *from the side* or *neighbourhood of, from the resources of;* it may also denote the means by which an act is set in operation.

If a thing or a circumstance is given with the passive as the occasion of the act spoken of in the verb, then the object is generally in the dative without a preposition. Also the person by whom a condition is brought about stands with a passive verb, sometimes in the dative without a preposition, most frequently with the perfect and the pluperfect, and regularly with the verbal adjective. Instances are given in the exercise.

Every passive predicate may be converted into an active one, or may be derived from an active one. In this change the object in the active representation becomes the subject in the passive.

Passive Predicate	ὁ παῖς τυπτεται ὑπο του ανδρος
(converted into)	the boy is struck by the man.
Active Predicate	ὁ ανηρ τυπτει τον παιδα.

If, however, a verb in the active voice takes two objects, only one of them can appear as subject in the passive. The Greeks prefer the personal object of the active as the subject for the passive, while the object which represents a thing is retained as an object, in the case of the object. This is so in instances in which the active takes both objects in the accusative; sometimes also when the personal object of the active appears in the dative.

The Greeks subjoined to intransitive verbs in the accusative the abstract object implied in the verb, saying, for instance, *to live a life*, βιον βιωναι. From this active a passive was formed, as βιος βεβιωται, *a life has been lived*. Agreeably to this usage they employed the verbal adjective, as βιος βιωτος, *liveable life; βιος αβιωτος, an unliveable life*, that is, a life tolerable or intolerable. Frequent is the use of the perfect passive (or middle) participle in this way, as τα ησεβημενα, *the impieties*.

In English, it is only transitive verbs that can properly appear in the passive. But in Greek, intransitive verbs may assume a passive form. Nor is the passive form limited to verbs which in the active govern an accusative case; but verbs whose active voice takes a genitive or a dative, are in Greek found in the passive or middle voice. In general the employment of that voice is more extended than is the use of the passive voice in English.

The middle form of the verb presents the subject as active, but at the same time as acted on by its own act. Hence the middle form is essentially reflective. The operation thus undergone by the subject is either immediate or mediate. If the operation is immediate, then the verb has simply a reflex import, inasmuch as the action comes directly back on the agent or subject. If the operation is mediate, then does that operation take place by means of an object, and by that object the operation is thrown back on the subject. Thus the reflective sense is intimately connected with the passive.

Some verbs altogether want the active form, and, appearing only in the middle, have the reflex or intransitive signification. These are called *deponents*, because they have laid down (in Latin, *de*, down, and *pono*, I put) the active form. These deponents may be divided into two classes—*middle deponents* and *passive deponents*. The middle deponents are those which form their aorist with a middle form, as αισθανομαι, *I perceive*, a. ησθομην. The passive deponents are those which form their aorist with a passive form, as δυναμαι, *I am able*, a. ἐδυνηθην.

For the expression of external circumstances the Greeks use the middle voice in its reflex sense but sparingly. Examples of such usage are

Reflective Verbs in the Middle Voice.

λουεσθαι	*to wash one's self, to bathe*
γυμναζεσθαι	*to exercise one's self, to contend*
στασθαι	*to place one's self, to stand.*

More common are reflective verbs employed to denote moral conditions, *e g.*

απεχεσθαι	*to hold one's self from, to abstain*
φυλαττεσθαι	*to guard one's self against*
παυεσθαι	*to make one's self cease, to stop*
ἐφιεσθαι	*to loose one's self on, to desire.*

Most common is the use of the reflective middle, when a condition of mind is represented, and the subject appears as in his own spirit producing a result, or as acting on his own internal state. Thus, παρεχειν means *to afford, to offer*, and παρεχεσθαι, *to offer* or *give one's self, to present from one's self, of one's own accord, from one's own resources*. So ποιεῖσθαι, from ποιεῖν, *to do*, means *to labour with one's own energies, to account something as so-and-so in one's own mind*. In the same way, λαμβανεσθαι, from λαμβανειν, *to take*, signifies *to take in, comprehend, form a conception of*. Again, βουλευεσθαι, from βουλευειν, *to counsel*, is to *counsel one's self, to take advice, to reflect, consider, consult*.

In order to express the act of a person who places himself in some external condition, the Greek language, like the English, employs the active voice and the personal pronoun, as πληττω εμαυτον, *I strike myself*.

Much more common is the mediate use of the middle voice to express that which is done in some way for or to the subject, for the benefit or interest, or at the command of the subject. This reference to the subject is sometimes strengthened by the reflective pronoun, as ἑαυτῳ εθετο νομον, *he made a law for himself*.

The Middle Voice used Mediately.

νιζεσθαι τους ποδας	*to wash one's feet*
μισθωσασθαι οικιαν	*to take a house*
αιτεισθαι τι	*to ask a favour*
προβαλλεσθαι τα ὁπλα	*to present arms*
αγεσθαι γυναῖκα	*to marry a wife*
μεταπεμπεσθαι τινα	*to send for a person*
αποπεμπεσθαι τινα	*to send away, get rid of*
αμυνεσθαι	*to guard one's self against, punish.*

The use of the middle voice, in contrast with the active, may be illustrated in the verb τιθεναι as τιθεναι νομους, *to establish or give laws* (the act of the legislator), and τιθεσθαι νομους, *to pass or enact laws* (the act of the legislature or people).

Sometimes the reference of the act to the subject is direct and obvious, as καιρεσθαι, *to get one's hair cut; διδασκεσθαι, to have one's self taught; so διδασκεσθαι τους παιδας, to secure instruction for one's children; δικαζεσθαι, to seek justice, to institute a lawsuit; παρατιθεσθαι την τραπεζαν, to procure one's self a table.*

For two tenses, the future and the aorist, there are special forms to express a strictly passive sense. Of these two forms, however, the aorist is used, instead of the middle form, in many reflective and intransitive verbs; all other tenses appear in the middle. Hence the rule—the future and the aorist of the middle have a reflex or intransitive signification and not a passive one, for which there are special forms (the future and the aorist passive), all the other tenses of the middle serve also to express passive meanings

EXERCISES.—GREEK-ENGLISH.

Ἑκτωρ απεθανεν ὑπο Αχιλλεως. Κριτιας ἐφυγεν ὑπο του ὁημου. Αλεμαιωνιδαι ὑπο των τυραννων ἐξεπεσον. Πανσανιας εις την ἑιρκτην ἐσπιπτει ὑπο των ἐφορων. Οἱ αγαθοι μισοῦνται ὑπο τῶν κακῶν. Πολις εκ βασιλεως δεδομενη εισι. Τουτο το πραγμα προσεταχθη εκ του Κυρου. Επραχθη απο των τυραννων ουδεν ἐργον αξιολογον. Μεγαρων οἱ πλειστοι απ' ἐξωμιδοποιους διατρεφονται. Αἱ βαναυσικαι τεχναι πανυ αδοξοῦνται προς των πολεων. Φαλῖνος ποτε πεμφθεις παρα βασιλεως εκελευσε τους Ἑλληνας τα ὁπλα παραδοῦναι. Ησαν αυτῳ καμηλοι πολλοι παρα των φιλων συνειλεγμεναι. Κυρος ὁ νεω-

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τερος αρχειν ην αξιωτατος, ὡς παρα παντων ὁμολογεῖται. Νοσῳ ἐφθαρμενοι εἰσιν οἱ Ἀθηναῖοι. Ἅπαντα ταυτα πεπρακται τοις ἐμου ψηφισμασι. Διοικοῦνται αἱ μεν τυραννίδες και ὀλιγαρχιαι τοις τροποις των ἐφεστηκοτων, αἱ δε δημοκρατιαι τοῖς νομοις τοις κειμενοις. Οἱ Κορινθιοι χρημασι δυνατοι ησαν, ὡς και τοῖς παλαιοῖς ποιηταῖς δεδηλωται. Των νοσηματων πολλαι θεραπεῖαι τοις ἰατροις εὑρηνται. Ταληθες ἀνθρωπος οὐκ εὑρισκεται. Εἰρηνης ἐπιθυμητεον ἐστιν ἀνθρωπους. Ἀσκητεον ἐστι σοι την ἀρετην. Ἀσκητεα ἐστι σοι ἡ ἀρετη. Διδασκουσι τους παῖδας τας τεχνας. Ὁ παις διδασκεται τας τεχνας. Παιδευω τον Σωκρατη την μουσικην. Σωκρατης μουσικην μεν ἐπαιδευθη ὑπο Ἀαμπρου, ῥητορικην δε ὑπ' Ἀντιφωντος. Ἀφαιροῦνται Κροῖσον την ἀρχην. Κροῖσος ἀφαιρεθεις την ἀρχην, διετριβε παρα τῳ Κυρῳ. Πειθω σε ταῦτα. Ἐγω ἐπεισθην ταῦτα ὑπο σου. Ἐπιτρεπω σοι την φυλακην. Οἱ ἐπιτεταγμενοι την φυλακην ἀπεκτειναν τους ἐχθρους. Οἱ λῃσται ἀναχθεντες προς βασιλεα ἀπετμηθησαν τας κεφαλας. Ἀποστειμνω σοι την κεφαλην. Ἐπιταττω σοι τουτο. Εἰ ξυγχωρησετε, και ἀλλα τι μεῖζον ἐυθυς ἐπιταχθησεσθε. Μεγαν κινδυνευεις κινδυνον. Ἀσεβοῦσι ἀσεβημα οὑτοι οἱ ἀνθρωποι. Ἀσεβημα ἀσεβεῖται. Τα κινδυνευθεντα σε σφαλλει. Ουκετι ἀπειλοῦμαι, ἀλλ' ἠδη ἀπειλω ἀλλοις. Τῳ ἀτρατηγῳ οἱ στρατωται ἐπιβουλευουσι. Πολλοι δια τον πλοῦτον ἐπιβουλευομενοι ἀπολλονται. Κρεῖττον ἐστι πιστευεσθαι ὑπο της πατριδος, ἡ ἀπιστεῖσθαι. Ἀσκεῖται το αει τιμωμενον, ἀμελεῖται δε το ἀτιμαζομενον. Οἱ πονηροι μονοι ἐπαινοῦσι ἑαυτους. Ἐτυψαμην την κεφαλην. Ὁ πατηρ τους παῖδας ἐδιδαξεν. Ὁ πατηρ τους παῖδας ἐδιδαξατο. Ἀργεῖοι ἑαυτων εἰκονας ποιησαμενοι ἀνεθεσαν εις Δελφους. Καταφρονῶ των φενακων. Καταφρονεῖται ὑπ' ἐμου ὁ λοιδορῶν.

Vocabulary and Remarks.

Εφυγεν, was banished, from *φευγω, I flee.*
Εξεπεσον (ἐξ and *πιπτω*), *were driven out.*
Εἰρκτη, ης, ἡ, an inclosure, a prison.
Ἐξωμιδοποια, ας, ἡ, the making of the garmen ts called ἐξωμιδες, a species of frock or cloak worn by males.
Βαναυσος ου, a mechanic or *smith, a land-labourer.*
Διοικεω, I live apart, I govern, manage (δια and οικος), *των ἐφιστηκ., of their governors; τοις κειμεν., the established laws.*
Συγχωρεω (συγχωρεω), *I go with, agree, yield.*

English-Greek.

The soldiers were slain (died) by the oitizens. Cicero (Κικερων) was banished by the people. That bad man was cast into prison by the judges. A good man is not hated by a good men. A city has been given to me from the king. These things are enjoined on yoo by your parents. Hand-workers are despised by the foolish. Socrates is allowed (confessed) by all to have been a very wise man. They have had their heads cut off. The bad man despises the good man. Good men are despised by had men. The yooths wash themselves. The girls are taught music hy me. I teach the girls music. Wisdom is to be desired by all. All wise men desire wisdom. Wisdom is desired hy me. They acquire wealth. They possess wealth. I take wealth from that bad man. Wealth is taken from foolish youths. My father persuades me to learn music. I am persuaded to teach my children. I shall cause my children to be taught. He caused his children to be taught music.

Historical Anecdotes.

Σωκρατης καλεσας ἐπι δεῖπνον πλουσιους, και της Ξανθιππης αἰδουμενης, ἐφη, θαῤῥει· ει μεν γαρ εἰεν μετριοι, συμπεριενεχθειεν ἂν· εἰδε φαῦλοι, ἡμῖν αὐτῶν οὐδεν μελησει. Αἰσχυνου δε εἰκοντος, πεινης εἰμι και ἀλλο μεν οὐδεν ἐχω, δίδωμι δε σοι ἐμαυτον, ἄρ' ουν, εἰπεν, ουκ αἰσθανῃ τα μεγιστα μοι δίδους; Σωκρατης βαθυτατα γηρῶν, εἰτα νοσῳ περιπεσων, ἐπει τις αὐτον ἠρωτησε, πῶς ἐχει; καλῶς, εἰπε, προς ἀμφοτερα· ἐαν μεν γαρ ζῶ, ζηλωτας ἐξω πλειονας· ἐαν δε ἀποθανω, ἐπαινετας πλειονας. Στρῳαντος δε Ἀντισθενους το διεῤῥωγος τοῦ τριβωνος εις τουμφανες, ὁρῶ σον, ἐφη, δια τοῦ τριβωνος την κενοδοξιαν. Ὁρῶν ὁ Σωκρατης τον Ἀλκιβιαδην τετυφωμενον ἐπι τῳ πλουτῳ και μεγα φρονοῦντα ἐπι τοῖς ἀγροῖς, ἠγαγεν αὐτον ἐπι τινα τοπον, ἐνθα ἀνεκειτο πινακιον ἐχον γῆς περιοδον, και προσεταξε την Ἀττικην ἐνταῦθα ἀναζητειν. Ὡς δε εὗρε, προσεταξε τους ἀγρους τους ἰδιους διαῤῥῆσαι· του δε εἰποντος, ἀλλ' οὐδαμου γεγραμμενοι εἰσι· ἐπι τουτοις, εἰπε, μεγα φρονεῖς, οἱῳ οὐδεν μερος τῆν γῆς εἰσιν. Ἐλεγεν ἡ Ξανθιππη ὡς, μυριων μεταβολῶν την πολιν κατασχουσῶν, ἐν πασαις ὁμοιον ἦν το Σωκρατους προσωπον, και προῖοντος ἐκ της οικιας και ἐπανιοντος αει θεᾶσθαι. Ἁρμοατο γαρ προς παντα ἐπιεικως, και ην ἱλεως αει την διανοιαν και λυπης ὑπιρανω πασης και φοβου κρειττων παντος ων.

Vocabulary, etc.

Συμπεριφερω, I form a companionship with, I am familiar with.
Φαῦλος, bad, low.
Θαῤῥεω, I am strong, bold; *θαῤῥει*, take courage!
Διδους ἀωθανομαι, is one of the verbs that take a participle after them instead of an infinitive.
Βαθυτατα γηρῶν, having become a very old man; *προς ἀμφοτερα*, in regard to both (life and death).
Ζηλωτης, οῦ, ὁ, an admirer.
Το διεῤῥωγος (from *διαῤῥηγνυμι*), the root; *τριβων, ωνος, ὁ*, an old bare cloak; *το ἐμφανες*; *αου* depends on *κενοδοξιαν*, vainglory, pride.
Τυφοω (our *typhus*), I puff up; *πινακιον, ου, το*, a tablet, here a map; *διαθρεω* (compare *θηρευω*), I seek out.
Ἁρμοζω, I fit, adapt, accommodate, hence our *harmony*.

LESSONS IN ITALIAN GRAMMAR.—No. XXXVII.

XVII.

Valére, to be worth.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *valére*, to be worth	Past: *avére valúto*, to have been worth
Present Geruod: *valéndo*, being worth	Past Gerund: *avéndo valúto*, having been worth
Past Participle: *valúto*, been worth	

Indicative Mood.

Present.

Véglio or *vólgo*, I am worth
vali, thou art worth
vále or *val*, he is worth
vagliámo or *valiámo*, we are worth
valéte, you are worth
vógliono or *vólgono*, they are worth

Imperfect.

Valéva or *valéa*, I was worth
valévi, thou wast worth
valéva or *valéa*, he was worth
valevámo, we were worth
valevate, you were worth
valévano or *valéano*, they were worth

Indeterminate Preterite.

Vólsi, I was worth
valésti, thou wast worth
válse, he was worth
valémmo, we were worth
valéste, you were worth
válsero, they were worth

Future.

Varrò, I shall or will be worth
varrái, thou wilt be worth
varrá, he will be worth
varrémo, we will be worth
varréte, you will be worth
varránno, they will be worth

Conditional Present.

Varréi, I should or would be worth
varrésti, thou wouldst be worth
varrébbe, he would be worth
varrémmo, we would be worth
varréste, you would be worth
varrébbero, they would be worth

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IMPERATIVE MOOD.

[No First Person.]
Vàli, be (thou) worth
vdglia or *vdlga*, let him be worth
vagliámo or *valiámo*, let us be worth
valéte, be (ye or you) worth
vógliano or *vdlgano*, let them be worth

SUBJUNCTIVE MOOD.

Present.
Che vàglia or *vdlga*, that I may be worth
che vàglia or *vdlga*, that thou mayst be worth
che vàglia or *vdlga*, that he may be worth
che vagliámo or *valiámo*, that we may be worth
che vagliáte or *valiáte*, that you may be worth
che vàgliano or *vàliano*, that they may be worth

Imperfect.
Che valéssi, that I might be worth
che valéssi, that thou mightst be worth
che valésse, that he might be worth
che valéssimo, that we might be worth
che valéste, that you might be worth
che valéssero, that they might be worth

So conjugate—

Equivalére, to be equivalent
Prevalére, to prevail
Prevalérsi, to take advantage
Rivalérsi, to recover

XVIII.

Vedére, to see.

INFINITIVE MOOD.

Simple Tenses.
Present: *vedére*, to see
Present Gerund: *vedéndo* or *veggéndo*, seeing
Past Participle: *veduto* or *visto*, seen

Compound Tenses.
Past: *avére veduto*, to have seen
Past Gerund: *avéndo veduto*, having seen

INDICATIVE MOOD.

Present.
Védo, *véggo*, or *véggio*, I see
védi or *vo'*, thou seest
véde, he sees
vediámo or *veggiámo*, we see
vedéte, you see
védono, *véggono*, or *véggiono*, they see

Imperfect.
Vedéva or *vedéa*, I saw
vedévi, thou sawest
vedéva or *vedéa*, he saw
vedevámo, we saw
vedevate, you saw
vedévano, they saw

Indeterminate Preterite.
Vidi, I saw
vedésti, thou sawest
vide, he saw
vedémmo, we saw
vedéste, you saw
vídero, they saw

Future.
Vedrò, I shall or will see
vedrài, thou wilt see
vedrà, he will see
vedrémo, we will see
vedréte, you will see
vedránno, they will see

Conditional Present.
Vedréi or *vedrìa*, I should or would see
vedrésti, thou wouldst see
vedrébbe or *vedrìa*, he would see
vedrémmo, we would see
vedréste, you would see
vedrébbero or *vedrìano*, they would see

IMPERATIVE MOOD.

[No First Person.]
Védi or *vo'*, see (thou)
véda, *végga*, or *véggia*, let him see
vediámo or *veggiámo*, let us see
vedéte, see (ye or you)
védano, *véggano*, or *véggiano*, let them see

SUBJUNCTIVE MOOD.

Present.
Che véda, *végga*, or *véggia*, that I may see
che véda, *végga*, *véggia*, or *véggi*, that thou mayst see
che véda, *végga*, or *véggia*, that he may see
che vediámo or *veggiámo*, that we may see
che vediáte or *veggiáte*, that you may see
che védano, *véggano*, or *véggiano*, that they may see

Imperfect.
Che vedéssi, that I might see
che vedéssi, that thou mightst see
che vedésse, that he might see
che vedéssimo, that we might see
che vedéste, that you might see
che vedéssero, that they might see

So conjugate—

Antivedére, to foresee
Avvedérsi, to perceive
Disvedére, to neglect
Divedére, to show
Malvedére, to hate
Prevedére, to foresee
Provvedére, provide
Rivedére, to see again
Sopravvedére, to observe attentively
Sprovvedére, to leave destitute
Stravedére, to see much
Travedére, to see double
Ravvedérsi, to amend

XIX.

Volére, to be willing.

INFINITIVE MOOD.

Simple Tenses.
Present: *volére*, to be willing
Present Gerund: *voléndo*, being willing
Past Participle: *volúto*, been willing

Compound Tenses.
Past: *avére volúto*, to have been willing
Past Gerund: *avéndo volúto*, having been willing

INDICATIVE MOOD.

Present.
Vóglio or *vo'*, I am willing
vuói, *vuóli*, or *vuo'*, thou art willing
vuóle, he is willing
vogliámo, we are willing
voléte, you are willing
vógliono, they are willing

Imperfect.
Voléva or *volèa*, I was willing
volévi or *volèi*, thou wast willing
voléva, *volèa*, or *volle*, he was willing
volevámo, we were willing
volevate, you were willing
volévano or *volèano*, they were willing

Indeterminate Preterite.
Vólli, I was willing
volésti, thou wast willing
vólle, he was willing
volémmo, we were willing
voléste, you were willing
vóllero, they were willing

Future.
Vorrò, I shall or will be willing
vorrài, thou wilt be willing
vorrà, he will be willing
vorrémo, we will be willing
vorréte, you will be willing
vorránno, they will be willing

Conditional Present.
Vorréi or *vorrìa*, I should or would be willing
vorrésti, thou wouldst be willing
vorrébbe or *vorrìa*, he would be willing
vorrémmo, we would be willing
vorréste, you would be willing
vorrébbero, *vorrìano*, or *vorrìano*, they would be willing

[This verb, according to good Italian grammarians, has no Imperative.]

SUBJUNCTIVE MOOD.

Present.
Che vóglia, that I may be willing
che vóglia, that thou mayst be willing
che vóglia, that he may be willing
che vogliámo, that we may be willing
che vogliáte, that you may be willing
che vógliano, that they may be willing

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Imperfect.	
Che volésssi, that I might be willing	*che volésssimo*, that we might be willing
che volésssi, that thou mightst be willing	*che volésste*, that you might be willing
che volésse, that he might be willing	*che voléssero*, that they might be willing

So conjugate—

Disvolére, to refuse	*Stravolére*, to wish for too much
Rivolére, to wish again	*Svolére*, to change one's mind

2ND IRREGULAR VERBS ENDING IN *ere* SHORT.

First.—Verbs ending in *ere*.

1.

Conóscere, to know.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses*
Present: *conóscere*, to know	Past: *avére conosciúto*, to have known
Present Gerund: *conoscéndo*, knowing	Past Gerund: *avéndo conosciúto*, having known
Past Participle: *conosciúto*, known	

INDICATIVE MOOD.

Present.	
Conósco, I know	*conoscéste*, you knew
conósci, thou knowest	*conóbbero*, they knew
conósce, he knows	Future.
conosciámo, we know	*Conoscerò*, I shall or will know
conoscéte, you know	*conoscerái*, thou wilt know
conóscono, they know	*conoscerà*, he will know
Imperfect.	*conoscerémo*, we will know
Conoscéva or *conoscéa*, I knew	*conosceréte*, you will know
conoscévi, thou knewest	*conoscerànno*, they will know
conoscéva or *conoscéa*, he knew	Conditional Present.
conoscevámo, we knew	*Conoscerèi* or *conoscería*, I should or would know
conoscevàte, you knew	*conoscerésti*, thou wouldst know
conoscévano or *conoscéano*, they knew	*conoscerébbe*, he would know
Indeterminate Preterite.	*conoscerémmo*, we would know
Conóbbi, I knew	*conoscerèste*, you would know
conoscésti, thou knewest	*conoscerébbero*, *conoscerìano*, or *conoscerìrno*, they would know
conóbbe, he knew	
conoscémmo, we knew	

IMPERATIVE MOOD.

[No first Person.]	
Conósci, know (thou)	*conosciámo*, let us know
conósca, let him know	*conoscéte*, know (ye or you)
	conóscano, let them know

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che conósca, that I may know	*Che conoscéssi*, that I might know
che conósca or *conósci*, that thou mayst know	*che conoscéssi*, that thou mightst know
che conósca, that he may know	*che conoscésse*, that he might know
che conosciámo, that we may know	*che conoscéssimo*, that we might know
che conosciáte, that you may know	*che conoscéste*, that you might know
che conóscano, that they may know	*che conoscéssero*, that they might know

So conjugate—

Preconóscere, to foresee	*Riconóscere*, to know again
Sconóscere, to be ungrateful.	

2.

Créscere, to grow.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *créscere*, to grow	Past: *avére cresciúto*, to have grown
Present Gerund: *crescéndo*, growing	Past Gerund: *avéndo cresciúto*, having grown
Past Participle: *cresciúto*, grown	

INDICATIVE MOOD.

Present.	
Créseo, I grow	*crescéste*, you grew
crésci, thou growest	*crébbero*, *crescéro*, or *crescèr*, they grew
crésce, he grows	Future.
cresciámo, we grow	*Crescerò*, I shall or will grow
crescéte, you grow	*crescerài*, thou wilt grow
créscono, they grow	*crescerà*, he will grow
Imperfect.	*crescerémo*, we will grow
Crescéva or *crescéa*, I grew	*crescerète*, you will grow
crescévi, thou grewest	*crescerànno*, they will grow
crescéva or *crescéa*, he grew	Conditional Present.
crescevámo, we grew	*Crescerèi* or *crescería*, I should or would grow
crescevàte, you grew	*crescerésti*, thou wouldst grow
crescévano or *crescéano*, they grew	*crescerébbe* or *crescería*, he would grow
Indeterminate Preterite.	*crescerémmo*, we would grow
crébbi, I grew	*crescerèste*, you would grow
crescésti, thou grewest	*crescerébbero* or *crescerìano*, they would grow
crébbe, he grew	
crescémmo, we grew	

IMPERATIVE MOOD.

[No First Person.]	
Créssi, grow (thou)	*cresciámo*, let us grow
créssa, let him grow	*crescéte*, grow (ye or you)
	créscano, let them grow

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che créssa, that I may grow	*Che crescéssi*, that I might grow
che créssa, that thou mayst grow	*che crescéssi*, that thou mightst grow
che créssa, that he may grow	*che crescésse*, that he might grow
che cresciámo, that we may grow	*che crescéssimo*, that we might grow
che cresciáte, that you may grow	*che crescéste*, that you might grow
che créscano, that they may grow	*che crescéssero*, that they might grow

So conjugate—

Accréscere, to increase	*Ricréscere*, to grow again
Decréscere, to decrease	*Riacréscere*, to increase
Discréscere, to decrease	*Rincréscere*, to displease
Incréscere, to be tired	*Scréscere*, to diminish

3.

Cuocere, to cook or bake.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *cuócere*, to cook	Past: *avére cótto*, to have cooked
Present Gerund: *cocéndo* or *succéndo*, cooking	Past Gerund: *avéndo cótto*, having cooked
Past Participle: *cótto*, cooked	

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INDICATIVE MOOD.

Present.	Future.
Cuóco, I cook	*Cuocerò* or *cocerò*, I shall or will cook
cuóci, thou cookest	*cuocerài* or *cocerài*, thou wilt cook
cuóce, he cooks	*cuocerà* or *cocerà*, he will cook
cociámo or *cuociámo*, we cook	*cuocerémo* or *cocerémo*, we will cook
cocéte or *cuocéte*, you cook	*cuoceréte* or *coceréte*, you will cook
cuócono, they cook	*cuocerànne* or *cocerànno*, they will cook
Imperfect.	**Conditional Present.**
Cocéva, *cocía*, or *cuocéva*, I cooked	*Cuocerèi*, *cocerèi*, or *cocería*, I should or would cook
cocévi or *cuocévi*, thou cookedst	*cuocerésti* or *cocerésti*, thou wouldst cook
cocéva or *cuocéva*, he cooked	*cuocerébbe*, *cocerébbe*, or *cocería*, he would cook
cocevámo or *cuocevámo*, we cooked	*cuocerémmo* or *cocerémmo*, we would cook
coceváte or *cuoceváte*, you cooked	*cuocerésta* or *cocerésta*, you would cook
cocévano or *cuocévano*, they cooked	*cuocerébbero*, *cocerébbero*, or *cocerìano*, they would cook
Indeterminate Preterito.	
Cóssi, I cooked	
cocésti or *cuocésti*, thou cookedst	
cósse, he cooked	
cocímmo or *cuocímmo*, we cooked	
cocíste or *cuocíste*, you cooked	
cóssero, they cooked	

IMPERATIVE MOOD.

[No First Person.]	
Cuóci, cook (thou)	*cuociámo* or *cociámo*, let us cook
cuóca, let him cook	*cuocéte* or *cocéte*, cook (ye or you)
	cuócano, let them cook

SUBJUNCTIVE MOOD

Present.	
Che cuóca or *cuócia*, that I may cook	*che cocéssi* or *cuocéssi*, that thou mightst cook
che cuóca, that thou mayst cook	*che cocésse* or *cuocésse*, that he might cook
che cuóca, that he may cook	*che cocéssimo* or *cuocéssime*, that we might cook
che cociámo, that we may cook	*che cocíste* or *cuocíste*, that you might cook
che cociáte, that you may cook	*che cocéssero* or *cuocéssero*, that they might cook
che cuócano or *cuóciano*, that they may cook	
Imperfect.	
Che cocéssi or *cuocéssi*, that I might cook	

So conjugate—

Concuócere, to concoct | *Ricuócere*, to stew again

LESSONS IN SPANISH.—No. II.

OF THE ARTICLE.

THE definite article, which in English is always *the*, is rendered in Spanish by different words, according to the gender and number of the nouns before which it is used.

Before a noun masculine of the singular number, *el* is used; as,

El hombre, the man. | *El hijo*, the son.
El rey, the king. | *El plato*, the plate.*

Before a noun feminine of the singular number, *la* is used; as,

La muger, the woman. | *La hija*, the daughter.
La reina, the queen. | *La cuchara*, the spoon.

Before a noun masculine of the plural number, *los* is used; as,

Los reyes, the kings. | *Los platos*, the plates.

Before a noun feminine of the plural number, *las* is used; as,

Las reinas, the queens. | *Las cucharas*, the spoons.

* In Spanish all nouns are either masculine or feminine.

Before an adjective used as a noun of the singular number, *lo* is employed when it has the meaning of *that which is*; as,

Lo bueno, the good, or, that which is good | *Lo justo*, that which is just.
Lo pasado, the past, or, that which is past. | *Lo rojo*, the red, or, that which is red.

Lo has no plural. It is called the *neuter* article.

The Spanish indefinite article corresponding to *a* or *an* in English is *uno* (always contracted into *un*), before a noun masculine; as,

Un médico, a physician. | *Un sombrero*, a hat.

Before a noun feminine, *una* is used; as,

Una hermana, a sister. | *Una silla*, a chair.

When the plural form of *uno* and *una* is used, these words are indefinite pronouns; as, *unos hombres* or *unas mugeres*, some men or some women.

The masculine articles *el* and *un* are always used before feminine singular nouns when they begin with *a* or *ha*, accented on the first syllable* (whether the accent is marked or not); as,

El ama, the mistress. | *El hambre*, the hunger.
Un arca, a chest. | *El agua*, the water.

In the plural, such nouns take the regular feminine article; as,

Las arcas, the chests. | *Las aguas*, the waters.

If an adjective intervene between the article and feminine noun (even though the adjective begin with *a* or *ha* accented), the feminine article is always used; as,

La ancha arca, the broad chest. | *Una buena ama*, a good mistress.

Remark.—There are very few feminine nouns in Spanish which begin with *a* or *ha* accented; so that the exceptions to the general use of *la* and *una* are very few.

When the preposition *á* (to) or *de* (of) comes immediately before the masculine article *el*, a contraction takes place, and both words are united. Thus, instead of *á el* and *de el* (*to the* and *of the*), *al* and *del* are used; as,

Al padre, to the father. | *Del muchacho*, of the boy.
Al ama, to the mistress. | *Del hambre*, of the hunger.

Before the other articles, *la*, *los*, *las*, *lo*, *un*, and *una*, the prepositions *á* and *de*, as well as the articles, remain unchanged; as,

A' la muger, to the woman. | *De los hombres*, of the men.
A' las hermanas, to the sisters. | *De lo futuro*, of the future.
A' un dia, to a day. | *De una noche*, of a night.

De el is sometimes used before the surnames of persons; as, *De el Cesar*, of the Cæsar.

The Spanish articles should not always be translated into English; and sometimes they are not expressed in Spanish when they would be in English; as,

La *humildad y* la *mansedumbre brillan ménos que* el *orgullo*,	Humility and meekness glitter less than pride.
La *vida no es un sueño*,	Life is not a dream.
Con todos los *hombres ten paz*,	With all men have peace.
El *capitan Smith tiene memória*,	Captain Smith has *a* memory.
Ella tiene marido,	She has *a* husband.

Sometimes the Spanish definite article should be rendered by the indefinite in English; as,

El paño se puede comprar á tres duros la *vara*.	The cloth can be bought for three dollars *a* yard.
La harina se vende á seis duros el *barril*.	Flour is sold at six dollars *a* barrel.

* Before feminine nouns singular beginning with *a* or *ha*, not accented on the first syllable, this rule does not apply; and, of course, *la* or *una* is used.

Vocabulary.

Hombre, man.	*Médico*, physician.
Muger, woman, wife.	*Criado*, male servant.
Marido, husband.	*Criada*, female servant.
Hermano, brother.	*Americano*, American.
Hermana, sister.	*Francesa*, French-woman.
Hijo, son.	*Alma*, soul.
Hija, daughter.	*Ama*, mistress, housekeeper.
Juez, judge	*Hambre*, hunger, famine.
Bello, beautiful.	*Cierto*, true.
Pasado, past.	*Futuro*, future.

Spanish-English.

El juez. El médico. La criado. Una Francesa. La muger. El hermano. Un criado. El alme. Un ama. El alma del hombre. La hermana del Americano. La hija de la Francesa. La criada de la muger. Lo cierto. Lo hello. Un criado del juez. Una hija del médico. Lo futuro. Al marido de la Francesa. A la mugor del juez. Al alma del ama. El hambre del criado. El hijo del harmano del médico. El criado de la muger. Al hermano del juez. A la hermana del Americano. Al hijo da la Francesa. A una hija del Americano. Lo pasado. A lo bello.

Tha plural of such words in the above vocahulary as end with a vowel, is formed hy adding *s* to the singuler; as, *hombre*, man; *hombres*, men.

Los hombres. Los maridos. Las criadas. Las hermanas de la Francesa. Los hijos del médico. A las hijas de la muger. A les hermanos del juez. Las almas de las Francesas. Las hijas del Americano. Las criadas do los médicos. Los hermanos del marido da la Francesa. Las hijas de los Americanos. Los hermanos de las criadas.

English-Spanish.

The man. Tha woman. The soul. The men. Tha physician. Tha daughters. A woman. A judga. A famine. A mistress. Tha brother of tha physician. The son of the French-woman. Tha husband of tha woman. Tha male-servant of the American. The sistar of the judga.

Tha brothers. The sisters. Tho sons of tho American. To tha brothers of tho physician. To tha souls of the female servants. The daughters of tha French-woman. The sisters of tha judga. The male servants of the sons of tha physician. Tha sons of tho sisters of tha American. Tha husbands of the daughters of the judge. The brothers of the female servants.

OF THE NOUN.

Nouns are divided into proper and common, as in English; and to them belong gender, number, person, and case.

Gender.

In Spanish Grammar, avery noun is considered as aither masuline or faminina, whather it really has any gender or not; thus, *pan*, bread; *sombrero*, hat; *plato*, plate; *papel*, paper; *azúcar*, augar—are masculine; while *casaca*, coat; *mantéca*, hutter; *água*, water; *mesa*, table—are feminina.

The folliowing are tha rulcs for distinguishing the gender:—

Nouns which ara the names of males, as well as thosa which denote the ranks, offices, professions, or employments of males, are masculine; as, *hombre*, man; *perro*, dog; *rey*, king; *cura*, rector; *pintor*, painter; *zapatero*, shoemaker.

Nouns which ara the names of females, as well as those which danote tha ranks, offices, professions, or employments of females, are feminina; as, *muger*, woman; *vaca*, cow; *reina*, queen; *costurera*, seamstress; *zapatera*, shoe-maker's-wife.

And of those which are not comprehended in the abova rules:—

Nouns which and in *a*, *d*, *ion*, *is*, and *ez*, ara feminina; as, *marca*, mark; *locura*, folly; *soledad*, solitude; *religion*, raligion; *hipótesis*, hypothesis; *timidez*, timidity.

Nouns which do not end in *a*, *d*, *ion*, *is*, and *ez*, are masculine; as, *zapato*, shoo; *honor*, honour; *té*, tea; *jabon*, soap.

Nouns used only in the plural are of tho gender to which they would belong, from their termination, if they had a singular form. Thus, *calzones*, breeches, is masculine, and *greves*, greaves, is feminine, because *calzon* and *greva* would he of these respective genders, from their termination. *Llaves*, *faces*, and *famas*, are exceptions to this rule, they being faminine.

Remark.—There are some few masculina nouns having feminine endings, and somo few feminine nouns which end otherwise than in *a*, *d*, *ion*, *is*, and *ez*.

Tha gender of tha noun can always be distinguished hy tha article used hefora it, except in the case of feminina nouns singular, begining with *a* or *ha*, accented on the first syllable. These, however, are very few in number.

Number.

The plural number is formed from the singular hy adding *es* to all nouns ending with a conconant, with tha latter *y*, or with any accented vowel; as,

Muger, woman.	*Mugeres*, women.
Rey, king.	*Reyes*, kings.
Alelí, gilliflower	*Alelíes*, gilliflowers.

Nouns anding with a vowel not accented, form their plurel by adding *s* to tha singular; as,

Villa, town.	*Villas*, towns.
Amigo, friend.	*Amigos*, friends.

Thera ara a few exceptiona to tha above general rules for the formation of the plural nouns; they are as follows:

If the noun end with *z*, this latter is changed into *ces* to form the plural; as,

Juez, judge.	*Jueces*, judges.

If the noun end with *é* accented, the plural is formed hy adding *s*; as,

Puntapié, kick.	*Puntapiés*, kicks.

If the noun end with *s* immediately preceded by a vowel *not accented*, no ehango takes place to form the plnral; as,

Hipótesis, hypothesis.	*Hipótesis*, hypotheses.

Tha following nouns are irragular in the formation of tha plural; *sofá*, sofa; *papá*, pope, fathar; *mamá*, mamma; *dux*, duka; their plurals being *sofás*, *papás*, *mamás*, *duces*.

Case.

In Spanish, nouns have but two cases, the *nominative* and *objective*,—tha former being tha agent or subject of tho verb; tha latter tha ohject of an action expressed hy the varb, or of a ralation expressed hy a preposition.

There is no *possessive* case in Spanish; property or possession is axpressed hy means of the preposition *de*; as,

El hijo de Juan, tho son of John, *i. e.* John's son.
La casa de la muger, the house of the woman, *i. e.* tha woman's house.
La conciéncia del hombre, the conscienca of tha man, *i. e.* the man's conscience.
El libro es de María, tha book is *of* Mary, *i. e.* the book is Mary's.
La pluma es del escribiente, the pen is of the clerk, *i. e.* the pen is the clerk's.

One noun cannot serve as an adjectiva for another noun, as in English; thus, such phrases as,—the York road; a paper hat; an ivory spoon; are in Spanish to be rendered *el camino de York*; *un sombrero de papel*; *una cuchara de marfil*; *i. e.* the road of (to or from) York; a hat of paper; a spoon of ivory. In Spanish, tha sentence "he went to his brotbar's," should be fully expressed thus: "*fué á casa de su hermano*," he went to (the) house of his hrother.

Remark.—That tha learner may be able to translate and to form completa sentences, a few verbs will now be placed in tho vocabulary. But as he is not yet acquainted with

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the form of conjugating verbs in Spanish, it is necessary to mention that of the few verbs for the present given in the vocabulary, those ending with *n* are in the third person plural, and of course are to be used when plural nouns are nominative to them: those in the vocabulary not ending with *n* are in the third person singular. In English we say, "the man *wrote*," and "the men *wrote*," (the verb being spelt alike in both the third persons singular and plural); but in Spanish we should say, *el hombre escribió*, "the man wrote," and, *los hombres escribieron*, "the men wrote."

In Spanish the general rule of construeting sentences is to produce *clearness* and *harmony*. Hence it is by no means important to place the nominative before the verb, as is usually the case in English. Thus in Spanish we can say, *Pedro dió el libro á María*, Peter gave the book to Mary; or, *Pedro dió á María el libro*, Peter gave to Mary the book; or, *Pedro á María dió el libro*, Peter to Mary gave the book; or, *Pedro á María el libro dió*, Peter to Mary the book gave; or, *á María dió Pedro el libro*, to Mary gave Peter the book; or, *dió Pedro á María el libro*, gave Peter to Mary the book; and each of these positions of the words is allowed by the rules of the Spanish construction, that form which is most *clear*, *forcible*, and *harmonious* being always preferred.

The learner will be able to distinguish the gender of nouns, either from their sex or from their termination. Any noun forming an exception to the general rules of gender, will have its gender specified in the vocabulary, and should be remembered by the learner.

Vocabulary.

Padre, father.	*Libro*, book.
Madre, mother.	*Carta*, letter.
Impresor, printer.	*Dinero*, money.
Pintor, painter.	*Oro*, gold.
Carpintero, carpenter.	*Plata*, silver.
Caballo, horse.	*Hoja*, leaf.
Navío, ship.	*Casa*, house.
Buey, ox.	*Cuchara*, spoon.
Hambre (fem.), hunger.	*Sed*, thirst.
El pintor tiene, the painter has.	*Los pintores tienen*, the painters have.
El pintor fué, the painter went.	*Los pintores fueron*, the painters went.
El pintor dió, the painter gave.	*Los pintores dieron*, the painters gave.
El pintor escribió, the painter wrote.	*Los pintores escribieron*, the painters wrote.

The Spanish for ship carpenter, is *carpintero de navío*, carpenter of ship. So, ship surgeon, coach horses, would be—surgeon of ship, horses of coach.

It cannot be said in Spanish, I am hungry, I am thirsty, I am afraid, but, I *have* hunger, I *have* thirst, I *have* fear. *El impresor tiene hambre*, should be translated in English, the printer is hungry, and not, the printer *has hunger*. So, John is thirsty, should be translated in Spanish, *Juan tiene sed*, John *has thirst*.

Spanish-English.

Los impresores tienen dinero. Las mugeres tienen hambre. Los pintores tienen libros. Los jueces tienen sed. Las mugeres dieron libros al padre de la Francesa. Los hombres dieron dinare á la madre del Americano. Los carpinteres fueron á casa* del pintor. Los médicos fueron á casa del juez. Los criados del juez escribieron cartas á las criadas de la Francesa. Los jueces escribieron cartas á la madre del pintor. Los carpinteres de navío tienen dinero.

English-Spanish.

The painters have money. The printers have books. The women have husbands. The carpenters gave a book to the son of the judge. The sons of the American gave money to the male servants of the physician. The daughters of the French-woman wrote letters to the sons of the judges. The physician wrote letters to the mother of the painter. The male servants of the physician wrote letters to the female servants of the French-woman. The printers went to (the) house of the judge. The horses are hungry. The men are thirsty. The oxen are thirsty.

* *Casa*, when it means a house, as a place of residence, or *home*, does not take the article before it, as in English.

LESSONS IN ARITHMETIC.—No. XXXI.

SUBTRACTION OF DECIMAL FRACTIONS.

Example.—From 425·684 subtract 216·96.

Explanation.	*Operation.*
Having written the less number under the greater, so that units may stand under units, tenths under tenths, etc., we proceed exactly as in subtraction of whole numbers. Thus, 0 thousandths from 4 thousandths leaves 4 thousandths. Write the 4 in the thousandths' place. Since the figure 9 in the lower line is larger than the one above it, we borrow 10. Now 9 from 16 leaves 7; set the 7 under the column and carry 1 to the next figure. Proceed in the same manner with the other figures in the lower number. Finally, place the decimal point in the remainder directly under that in the given number.	425·684 216·96 208·724 *Ans.*

To subtract one Decimal Fraction or Mixed Number from another.

Rule.—*Write the less number under the greater, placing units under units, tenths under tenths, hundredths under hundredths, etc. Subtract as in whole numbers, and point off the answer as in addition of decimals.*

Proof.—*Subtraction of Decimals is proved in the same manner as Simple Subtraction.*

When there are blank places on the right hand of the upper number, they may be supplied by ciphers without altering the value of the decimal.

EXERCISES.

1. From 456·0546 take 364·3123.
2. From 1460·39 take 32·756218.
3. From 21·67 take ·682349.
4. From 81·6823401 take 9·163.
5. From 100·536 take 19·36723.
6. From ·076345 take ·009623478.
7. From 1 take ·99.
8. From 10 take ·000001.
9. From 65·00001 take ·9682347.
10. From 3·29 take ·999.
11. From 10 take ·0000001.
12. From 9 take ·999999.
13. From 4636 take ·4654.
14. From 25·6050 take 567·392.
15. From 76·2784 take 29·84234.
16. Take ·0000001 from ·0001.
17. Take ·0000004 from ·00004.
18. From 32 take ·00032.
19. From 24681 take ·87623.
20. From 25 take ·25.
21. Take ·00045 from 45.
22. Take ·00000099 from 99.
23. From 1 thousandth take 1 millionth.
24. From 7 hundred take 7 hundredths.
25. From 29 thousand take 92 thousandths.
26. From 256 millions take 256 thousandths.
27. From 46 hundredths take 46 thousandths.
28. From 95 thousandths take 999 ten thousandths.
29. From 1 billionth take 1 trillionth.
30. From 2874 millionths take 211 billionths.
31. From 6231 hundred thousandths take 154 millionths.
32. From 7213 ten thousandths take 431 hundred thousandths.
33. From 8436 hundred millionths take 426 ten billionths.

MULTIPLICATION OF DECIMALS.

Example.—If a man can reap ·96 of an acre in a day, how much can he reap in ·5 of a day?

Analysis.—Since he can reap 96 hundredths of an acre in a whole day, in 5 tenths of a day he can reap 5 tenths of that quantity. But multiplying by a fraction, we have seen, is taking a part of the multiplicand as many times as there are

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like parts of a unit in the multiplier. Hence, multiplying by ·5, which is equal to $\frac{1}{10}$, or $\frac{1}{2}$, is taking *half* of the multiplicand *once*. Now ·96, or $\frac{96}{100} \div 2 = \frac{48}{100}$. But $\frac{48}{100} = ·48$, which is the answer.

Explanation.

We multiply as in whole numbers, and pointing off as many decimals in the product as there are decimal figures in both factors, we have ·480; but ciphers placed on the right of decimals do not affect their value; the 0 may therefore be omitted, and we have ·48 for the answer, as before.

Operation.

·96
·5
·480 *Ans.*

To multiply Decimal Fractions or Mixed Numbers by each other.

RULE.—*Multiply as in whole numbers, and point off as many figures from the right of the product for decimals, as there are decimal places both in the multiplier and multiplicand. If the product does not contain so many figures as there are decimals in both factors, supply the deficiency by prefixing ciphers.*

PROOF.—*Multiplication of Decimals is proved in the same manner as Simple Multiplication.*

The *reason* for pointing off as many decimal places in the product as there are decimals in both factors, may be illustrated thus:—Suppose it is required to multiply ·25 by ·5. Supplying the denominators we have ·25 = $\frac{25}{100}$, and ·5 = $\frac{5}{10}$. Now, $\frac{25}{100} \times \frac{5}{10} = \frac{125}{1000}$. But $\frac{125}{1000} = ·125$; that is, the product of ·25 × ·5, contains just as many decimals as the factors themselves. In like manner it may be shown that the product of any two or more decimal numbers, must contain as many decimal figures as there are places of decimals in the given factors.

EXERCISES.

1. In 1 rod there are 16·5 feet: how many feet are there in 41·3 rods?
2. In 1 degree of the earth's circumference there are 69·05 British miles: how many miles are there in 360 degrees?
3. In 1 barrel there are 31·5 gallons: how many gallons in 65·25 barrels?
4. In 1 inch there are 2·25 nails: how many nails are there in 60·5 inches?
5. In 1 square rod there are 30·25 square yards: how many square yards are there in 26·05 rods?
6. In 1 square rod there are 272·25 square feet: how many square feet are there in 160 rods?
7. How many square rods are there in a field 60·5 rods long and 40·75 rods wide?

Multiply the following decimals into each other, and point the products according to rule:

8. 1·0013 × ·25.	21. 40·4368 × 1 2904.
9. 44·048 × ·43.	22. 100·0008 × ·000306.
10. 3·6051 × 4·1.	23. 75·35060 × 62·3906.
11. 0·1003 × 6·12.	24. 31·50301 × 17·0352.
12. 8·0004 × ·004.	25. 0·000713 × 2·30561.
13. 35·601 × 1·032.	26. 42·10062 × 3·621013.
14. 213·02 × 4·318.	27. 1·0142034 × ·0620034.
15. 0·0006 × 00012.	28. 25067623 × ·0000001.
16. 0·3005 × ·0035.	29. 64·301257 × 1·000402.
17. 10·2010 × 38·26.	30. 394·20023 × 00000003.
18. 164·023 × 1·678.	31. 2564·21035 × 4·300606.
19. 9·40061 × 15·812.	32. 840003·1709 × 112·10371.
20. 7·31042 × 10·021	33. 0·834567834 × 00000008.

CONTRACTIONS IN MULTIPLICATION OF DECIMALS.

I. When the multiplier is 10, 100, 1000, etc., the multiplication may be performed by simply *removing the decimal point* as many places towards the *right* as there are ciphers in the multiplier.

EXERCISES.

1. Multiply 85·4321 by 100; and 42930·213401 by 10.
2. Multiply 1067·2350123 by 100; and 608·34017 by 1000.
3. Multiply 30·467214967 by 10000; and 446·3214022 by 100000.
4. Multiply 21·3456782106 by 100000; and 5 tenths by 1000.
5. Multiply 75 hundredths by 100000; and 65 ten thousandths by 1000.
6. Multiply 48 hundred thousandths by 100000; and 248 thousandths by 10000.
7. Multiply 381 ten thousandths by 10000; and 6504 ten millionths by 100000.
8. Multiply 634 thousandths by 1000000; and 1 millionth by 10000000.

II. When the number of decimal places in the multiplier and multiplicand is large, the number of decimals in the product must also be large. But decimals below the fifth or sixth order, express such small parts of a unit, that when obtained they are commonly rejected. It is therefore desirable to avoid the unnecessary labour of obtaining those which are not to be used.

Example 1.—It is required to multiply 1·3569 by ·36742, and retain five places of decimals.

Explanation.

It is evident from the nature of decimal notation, that if the partial product of each figure in the multiplier is advanced one place to the right instead of the left, the operation will correspond with the descending scale, and at the same time will give the true product. But since only five decimals are required, those on the right hand of the upright line are useless, and the answer may be found without them, according to the following process.

Operation

1·3569
·36742
·40707
8141 | 4
949 | 83
54 | 276
2 | 7138
·49855 | 2198 *Ans.*

Explanation.

Beginning at the right hand, we first multiply the multiplicand by the tenths' figure of the multiplier, and place the first figure of the partial product under the figure multiplied. In obtaining the second partial product (*i. e.* multiplying by 3), it is plain we may omit the *right hand* figure of the multiplicand, for, if multiplied, its product will fall to the right of the upright line, as seen above, and therefore will not be used. But if we multiply 9 into 6, the product is 54; and there is 5 to carry to the next product 36, which makes 41. Again, in the third partial product (*i. e.* in multiplying by 7), we may omit the *two* right hand figures of the multiplicand; for, their product will fall to the right of the upright line. But by recurring to the rejected figures, it will be seen that the product of 7 into 6 is 42, and 6 to carry make 48; we, therefore, add 5 to the product of 7 into 5, because 48 is nearer 50 than 40; consequently, it is nearer the truth to carry 5 than to carry 4. In the fourth partial product we may omit the *three* right-hand figures, and in the fifth or last, the *four* right-hand figures.

Contraction.

1·3569
·36742
·40707
8141
950
51
3
·49855 *Ans.*

Example 2.—Multiply ·2358 by ·3765, and retain 4 decimals in the product.

Explanation.

Multiplying as before, the first figure of the partial product must be set in the fifth order, or one place to the right of the figure multiplied; for there are four decimals in the multiplicand, and the one by which we multiply makes 5. But since we wish to retain only 4 decimals in the product, we may omit this figure, carrying 2 to the next product. Proceed in the same manner with the other figures in the multiplier. Finally, the sum of the partial products which are retained is the answer required.

Operation.

·2358
·3765
0707
165
14
1
·0887 *Ans.*

To multiply decimals and retain only a given number of decimal figures in the product.

RULE.—*Count off in the multiplicand as many decimal places less one, as are required in the product. Then beginning at the right hand figure counted off, multiply the multiplicand by the tenths or first decimal figure of the multiplier, and set the first figure of the partial product one place to the right of the figure multiplied, increasing it by the nearest number of tens that would arise from the rejected figure if multiplied. Next multiply by the second decimal figure, omitting the next right-hand figure of the multiplicand and carrying as before. Proceed in the same manner with all the figures of the multiplier whose product will come under the decimal places counted off, omitting an additional figure on the right of the multiplicand, as you multiply by each successive figure, and set the first figure of each partial product under that of the preceding. Finally, from the sum of the partial products, cut off the required number of decimals, and the result will be the answer.*

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In order to determine where to place the *decimal point* in the product, we have only to observe that the product of the right-hand figure of the multiplicand into the *tenths* of the multiplier is of the order denoted by the *sum* of the orders of the two figures multiplied; and when the multiplier is tenths it is of the order *next lower* than the figure multiplied. For this reason the first partial product is set one place to the right of the figure multiplied. But since we count off one decimal less than is required in the product, the right-hand figure in the sum of the partial products must consequently be the right-hand decimal place in the answer.

If the multiplier contains *units*, *tenths*, *hundredths*, etc., in multiplying by the units, we must begin *one* figure to the right of those counted off, and set the first figure of the partial product under the figure multiplied. In multiplying by the tens, we must begin *two* figures to the right of those counted off, and set the first figure of the partial product under that of the units; in multiplying by the hundreds, we must begin *three* figures to the right, and set the first figure of the partial product under that of the preceding, etc. This will bring the same orders under each other.

Example 1.—Multiply ·72543414 by ·21626421, retaining 5 decimal places in the product.

Explanation.	*Operation.*
Having counted off 4 decimals in the multiplicand, increase the product of 2 into 4 by 1, because the product of the 3 rejected, into 2 is nearer 10 than 6. Set the 9 one place to the right of the figure multiplied, and proceed as directed. The four in the last partial product, is the number which would be carried to this order, if the 7 were multiplied by 6.	·7254 3414 ·2482 6421 1450 9 290 2 58 0 1 4 4 ·1800 9 *Ans.*

Example 2.—Multiply 67·1498601 by 92 4023553, retaining four decimals in the product.

Explanation.	*Operation.*
In this operation we multiply first by the tens figure of the multiplier, beginning two places to the right of those counted off in the multiplicand: that is, we begin at 6 in the multiplicand, two places to the right of 9 the first figure on the right to be retained, and multiply by 9 the first figure on the left of the multiplier. It is immaterial as to the result whether we multiply by the tenths first, or by the units, tens, or hundreds, provided we set the first figure of the partial product in its proper place.	67·149 6601 92·402 3553 6043·487 4 134·299 7 26·859 9 134 3 20 1 3 4 3 6204·606 1 *Ans.*

EXERCISES.

1. Multiply ·863541 by ·10983 retaining 5 decimal places.
2. Multiply 1·123674 by 1·123674 retaining 6 decimal places.
3. Multiply ·26736 by ·28756 retaining 4 decimal places.
4. Multiply ·1347866 by ·288793 retaining 7 decimal places.
5. Multiply ·681472 by ·01286 retaining 5 decimal places.
6. Multiply ·053407 by ·047126 retaining 6 decimal places.
7. Multiply ·3857461 by ·0046401 retaining 6 decimal places.

DIVISION OF DECIMAL FRACTIONS.

Example.—How many bushels of oats, at ·2 of a crown per bushel, can you buy for ·84 of a crown?

Analysis.—Since 2 tenths of a crown will buy 1 bushel, 84 hundredths of a crown will buy as many bushels, as 2 tenths is contained times in 84 hundredths. Now, ·84=$\frac{84}{100}$; and ·2=$\frac{20}{100}$, or $\frac{20}{100}$. And $\frac{84}{100}\div\frac{20}{100}=\frac{84}{20}=4\frac{4}{20}$, or $4\frac{1}{5}$. But, $4\frac{1}{5}$=4·2, which is the answer required.

Explanation.	*Operation.*
We divide as in whole numbers, and point off one decimal figure in the quotient, for the *reason* explained below.	·2)·84 4·2 *Ans.*

We have seen in the multiplication of decimals, that the product has as many decimal figures, as the multiplier and multiplicand. Now, since the dividend is equal to the product of the divisor and quotient, it follows that the *dividend* must have as many decimals as the *divisor* and *quotient together*; consequently, as the dividend has *two* decimals, and the divisor but *one*, we must point off *one* in the quotient.

The quotient must, therefore, have as many decimal figures, as the decimal places in the dividend exceed those in the divisor; that is, the decimal places in the divisor and quotient together, must be equal in number to those in the dividend.

Example.—What is the quotient of ·0072 divided by 2 4?

Explanation.	*Operation.*
Since the dividend has three decimals more than the divisor, the quotient must have three decimals. But as it has but one figure, we prefix two ciphers to it to make up the deficiency.	2·4)·0072(·003 *Ans.* 72

It will be noticed that 3, the first figure of the quotient, denotes *thousandths*; also the product of 2, the units figure of the divisor, into the first quotient figure, is written under the *thousandths* in the dividend.

The first figure of the quotient, therefore, is of the same order, as that figure of the dividend under which is placed the product of the units of the divisor into the first quotient figure.

To divide one decimal fraction by another.

RULE.—*Divide as in whole numbers, and point off as many figures for decimals in the quotient, as the decimal places in the dividend exceed those in the divisor. If the quotient does not contain enough of figures, supply the deficiency by prefixing ciphers.*

PROOF.—*Division of Decimals is proved in the same manner as Simple Division.*

When there are *more* decimals in the divisor than in the dividend, annex as many ciphers to the dividend as are necessary to make its decimal places *equal* to those in the divisor.

After all the figures of the dividend are divided, if there is a remainder, ciphers may be annexed to it and the division continued at pleasure. For ordinary purposes, it will be sufficiently exact to carry the quotient to three or four places of decimals; but when great accuracy is required, it must be carried farther. When there is a remainder, the sign + is usually annexed to the quotient, to show that it is not complete.

EXERCISES.

1. How many boxes will it require to pack 71·5 lbs. of butter, if you put 5·5 lbs. in a box?
2. How many suits of clothes will 29·6 yds. of cloth make, allowing 3·7 yds. to a suit?
3. If a man can walk 30·25 miles per day, how long will it take him to walk 150·75 miles?
4. How many loads will 134642·156 lbs. of hay make, allowing 1622·2 lbs. for a load?
5. If a team can plough 2·3 acres in a day, how long will it take to plough 63·75 acres?
6. How many bales of cotton in 56343·75 lbs., allowing 375 lbs. to a bale?

Find the quotients indicated by the following expressions:—

7. 46·64÷7·9.
8. 1·658÷·25.
9. 67231÷·85.
10. 4·00334÷6 31.
11. 73·8243÷·061.
12. 0·00033÷·011.
13. 236·041÷1·75.
14. 60·0001÷1·01.
15. 300·402÷12·1.
16. 4·32067÷·001.
17. 0·00006÷·003.
18. 167342÷·002.
19. 684234·6÷2682.
20. 0·000045÷9.
21. 7·231068÷·12.
22. 26·3645÷·125.
23. 4÷·00001.
24. 6÷·0000001.
25. 0·8÷·0000002.
26. 6541·234567÷21.
27. 7461·30765÷112.

CONTRACTIONS IN DIVISION OF DECIMALS.

I. When the divisor is 10, 100, 1000, etc., the division may be performed by simply *removing the decimal point* in the dividend as many places towards the *left*, as there are ciphers in the divisor, and it will be the quotient required.

EXERCISES.

1. Divide 4672·3 by 100.
2. Divide 0·6 by 10000.
3. Divide 672345·67 by 10.
4. Divide 10342·306 by 100.
5. Divide 42643·621 by 100000.
6. Divide 6723000·45 by 10000000.
7. Divide 1·2300456 by 100000.
8. Divide 2·0076346 by 1000000.

When the divisor contains a large number of decimal figures, the process of dividing may be very much abridged.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LVIII.

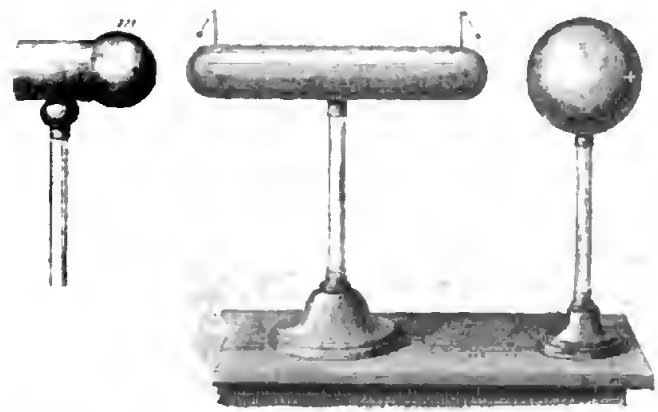
(*Continued from page* 68.)

ELECTRICITY.

ACTION OF ELECTRISED BODIES ON BODIES IN THEIR NATURAL STATE.—ELECTRICAL MACHINES.

Electrisation by Influence.—An electrified body acts upon a body in a neutral state in the same manner as a magnet acts upon soft iron; that is to say, it decomposes the neutral fluid, attracts the electricity of a contrary kind to that which it possesses, and repels that of the same kind. To express this effect, which is a consequence of the mutual action of the two electricities, we say that the body, which was at first in a neutral state, is now electrised by induction or influence. Electrification or electrisation by influence, is proved by means of a yellow copper cylinder, isolated on a glass support, and having at its ends two small electric pendulums formed of pith balls suspended by conducting threads made of hemp. Place this cylinder about an inch or less from one of the conductors *m* of an electrical machine, and this latter, as will be soon seen, will become charged with positive electric fluid, and will attract the negative and repel the positive fluid, so that the fluids being then distributed as the signs + and — marked in our engraving, each pendulum will be repelled. To ascertain the species of electricity with which the ends of the cylinder are charged, rub a stick of sealing-wax, and on presenting it to the pendulum nearest the electrical machine, repulsion is observed, which shows that the pendulum is charged with the same electricity as resin, that is to say, with negative fluid. On presenting a glass tube that has been rubbed to the second pendulum, there is also repulsion, consequently the pendulum is electrised positively. Therefore, a body electrised by influence possesses at the same time, in two opposite quarters, the two sorts of electricity in a free state. Between the parts electrised in a contrary way, there is necessarily a middle region in a neutral state, which may be proved by arranging several small pendulums along the cylinder. Their divergence decreases rapidly as we recede from the ends, and disappears towards the middle.

Fig. 383.



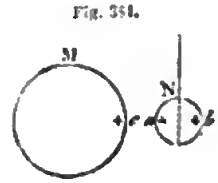
A body electrised by influence acts in its turn upon neighbouring bodies so as to separate their two fluids, as is seen in the insulated ball represented next to the cylinder. It is proved by placing a second cylinder with pendulums in a line with the first.

All bodies electrised by influence exhibit the two following principles: 1. Directly the influence ceases, the two fluids are re-combined and the body retains no trace of electricity. This principle is proved with the cylinder in fig. 383, for the balls of the two pendulums fall back on being removed from the source of electricity, or on bringing this latter to a neutral state by touching it with the finger. 2. When a conducting body is electrised by influence, if it is touched at any one of its points, whether with a metallic stick or the finger, it is always the fluid of the same name as that of the electric source which disappears in the earth, the fluid of a contrary name being retained by the attraction of the fluid of the source. For example, in the above cylinder, it is the negative fluid that remains, whether it is touched at the positive or the negative end or in the middle. It is in consequence of electrisation by influence that an electrical machine cannot be charged if there is a metallic point in communication with the ground near it; in fact, the positive fluid of the machine acting by influence upon the point, a continual current of negative fluid flows from it and neutralises the electricity of the machine.

Communication of Electricity at a Distance.—In the experiment represented in fig. 383, the contrary electricities of the conductor *m* and the cylinder tend to unite, and they are only kept at the surfaces of the two bodies by the resistance of the air. But if the distance is diminished or the tension increased, the attractive force of the two electricities overcomes the obstacle that separates them, and they then re-unite through the air, giving rise to a spark more or less bright accompanied by a cracking sound. The negative electricity of the cylinder being then neutralised by the positive electricity of the machine, there remains in the cylinder only the positive electricity which is preserved, though the influence has just ceased. The same phenomenon takes place when the finger is presented to a body highly charged with electricity. The body decomposes the natural electricity of the hand by influence, attracts with a spark a contrary fluid, and repels into the ground the fluid of the same name. As to the distance at which explosion takes place, it varies according to the tension of the electric fluid, the form of the bodies, their conducting power, and the greater or less resistance of the surrounding media. All that we have said hitherto applies to the electrisation of good conductors. Bad conductors are not easily electrised by influence, but when once electrised they retain their electric state a considerable time after the cause which has produced it.

Motion of Electrised Bodies.—The theory of electrisation by influence, explains the motions of attraction and repulsion

Fig. 384.



which take place in electrised bodies. A fixed body M, fig 384, electrised positively being given, and a moveable body

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is placed at a small distance from the former, there are three cases to be considered.

1. *The Movable Body is in a Natural State and a Conductor.*—In this case the body M acting by influence on the neutral fluid of the body N, attracts the negative fluid and repels the positive, so that the maximum of the tension of the two fluids takes place at the points *a* and *b* respectively. Now electric attraction and repulsion being inversely as the square of the distance, the attraction between the points *a* and *c* is greater than the repulsion between *b* and *c*, and the movable body approaches the fixed body with a resultant force equal to the excess of the attractive over the repulsive force.

2. *The Movable Body is Electrised and a Conductor.*—If the movable body is charged with contrary electricity to that of the body M, there is always attraction; if it is charged with the same electricity, there is repulsion for a certain distance, but at a shorter distance there may be attraction without contact. To explain this anomaly, it is sufficient to observe that, besides the free fluid which the movable body already contains, it also contains natural fluid, which being decomposed by the positive influence of the body M, the hemisphere *b* receives a fresh quantity of positive fluid, while the hemisphere *a* is charged with negative fluid; consequently there is, as in the preceding case, attraction and repulsion. The latter overpowers the former at first, because the quantity of positive fluid in the body N is greater than that of negative; but as the interval *a c* is diminished, the attractive force increases quicker than the repulsive, and may at last exceed it.

3. *The Movable Body is a Bad Conductor.*—If the movable body is a bad conductor and electrised, it is repelled or attracted according as it is charged or not with the same electricity as the fixed body. If it is in the natural state, as a powerful source of electricity whose action is prolonged can always more or less decompose the natural fluid even in bad conductors, this fluid is decomposed under the influence of the body M, if M is sufficiently electrised, and then there is attraction.

The Gold Leaf Electroscope.—Electroscopes or electrometers are apparates for ascertaining whether a body is electrised and with what kind of electricity. The electric pendulum already described is an electroscope. There are various apparatus employed for this purpose, but we shall confine ourselves to the gold leaf electroscope at present. It is also called Bennet's electrometer, and consists of a glass jar B, fig. 385, resting upon a plate of copper, and having its neck stopped by a cork covered with isolating varnish, which also coats all the upper part of the jar. Through the cork passes a copper wire having a ball C of the same metal at one end, and two pieces of gold leaf beaten very thin at the other, inside the jar. When a body is charged with any electricity whatever—*e.g.* negative as indicated in the figure—this electricity acting by influence upon the neutral fluid of the ball and the wire, the positive fluid in the ball is attracted and the negative repelled towards the pieces of gold leaf, which, being charged with the same kind of electricity, repel each other, and thus we see that the body A is electrised.

It is easy to ascertain the kind of electricity with which the body is charged. To accomplish this, touch the ball C with the finger while the instrument is under the influence of the body A. The electricity of the same name as that with which the body A is charged is then repelled to the ground, and the ball as well as the wire remain charged with electricity

Fig. 385.

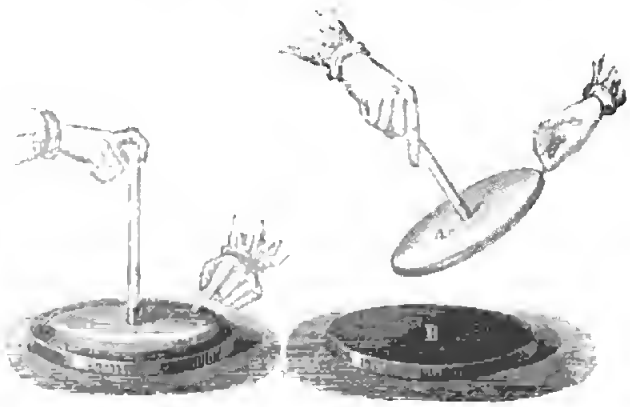


contrary to that of the body. The pieces of gold leaf fall together, but on withdrawing the finger and then the body A, they diverge again. Then to ascertain the kind of electricity in the apparatus, bring a glass stick rubbed with wool slowly near the ball C. If the divergence of the pieces of gold leaf increases, it shows that the electricity of the electroscope is repelled to the lower part, whence we conclude that it is of the same kind as that of glass, that is to say, positive. But if the divergence diminishes, the electricity of the apparatus is attracted by that of the glass; it is therefore contrary to it, that is, negative.

ELECTRICAL MACHINES.

Electrophorus.—Electrical machines are apparatus for obtaining a more or less abundant development of statical electricity. The most simple of electrical machines is the *electrophorus*. This apparatus, invented by Volta, is composed of a cake of resin B, fig. 387, and a wooden disc A, covered with a tin-foil, and furnished with a glass isolating handle. To obtain electricity by means of this apparatus, first dry the cake of resin and the wooden disc by warming them slightly; then beat the resin hard with cat's skin, which will electrise it negatively. Then placing the disc covered with tin-foil on the resin, fig. 386, the latter, being a very bad conductor, retains its negative electricity, and by its influence on the disc, it attracts the positive fluid to the surface which is in contact with it, while it repels the negative fluid to the other. Then touching the tin-foil with the finger, you withdraw the negative fluid, and the wooden disc remains electrised positively. In fact, if you

Fig. 386. Fig. 387.



take it away with one hand by the glass handle, and bring the other hand near it fig. 387, a bright spark is produced, owing to the recomposition of the positive fluid of the disc with the negative fluid of the hand.

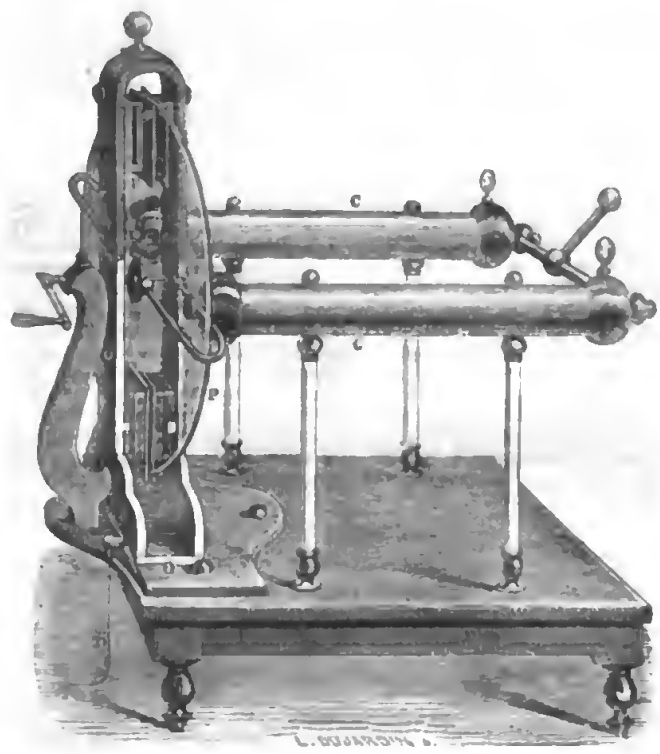
In dry air the cake of resin, having been once electrised, may retain its electricity for months, and you may obtain all this time as many sparks as you like, without beating the resin again with cat's skin, provided you take care each time first to touch the disc covered with tin-foil while it is in contact with the resin, and again a second time when you hold it by the glass handle. The electrophore is employed in chemistry to make gaseous compounds explode in the eudiometer by means of the electric spark.

Ramsden's Electrical Machine.—The first electrical machine was made by Otto de Guericke, who also invented the air-pump. It consisted of a sulphur sphere fixed to an axis turned with one hand, while the other rested on the sphere and served to rub it. The ball of sulphur was soon exchanged for a glass cylinder, the hand being still employed to rub it. Towards 1740, Winkler, a German philosopher, first made use of a horse-hair cushion covered with silk for rubbing. At the same period, Boze, professor in the Duchy of Wurtemberg, collected the electricity disengaged by friction by means of a tin-plate isolated tube. At last, in 1766, Ramsden, in London, substituted for the glass cylinder a circular glass plate rubbed by cushions. The electrical machine then took the form which it still generally retains.

Between two wooden supports, fig. 388, is a circular glass plate P, fixed at its centre to an axis which is turned by means of a winch. This plate is pressed by four leather or silk cushions or rubbers R, at the extremities of its vertical diameter. In a line with its horizontal diameter are two brass tubes bent round as seen in the figure, and called combs, because they are furnished with a number of spikes on the sides facing the plate. These combs are attached to two larger tubes C, called conductors, which stand on four glass legs, and are connected together by one of a smaller diameter. As the glass plate moves round it is electrised positively and the cushions negatively. These latter communicating with the earth by the wooden supports, immediately lose their electricity as fast as it is produced. The positive electricity of the plate acts by influence upon the conductors and attracts the negative fluid, which, being set free at the spikes, combines with the positive electricity of the glass and neutralises it. The conductors, which thus lose their negative electricity, therefore remain positively electrised. Consequently, in the electrical machine the plate communicates nothing to the conductors, it is only necessary to withdraw from them the negative fluid arising from the decomposition of the natural fluid.

The machine being once charged, on placing the hand near it a strong spark is elicited, which is repeated as long as the plate continues to be turned, for the spark being the result of the combination of the negative fluid of the hand with the positive fluid of the machine, the latter tends at each spark to return to the neutral state, but the influence of the plate electrises it afresh. To give an electrical machine all the activity of which it is susceptible, it is of consequence to dry the supports, the plate and the cushions carefully, by gently warming them, or wiping them with a warm cloth. The cushions require particular attention both as to their arrangement and keeping them in good condition. Those most in use are made of thin leather stuffed with horse-hair and covered with mosaic gold, a substance which greatly increases the development of electricity, probably by a chemical reaction, if we may judge from the sulphurous odour given out by the cushions on being rubbed.

Fig. 388.



Within the last few years, the old rubbers have been brought into use, which were introduced by Van Marum in 1788, and which give electrical machines a much greater degree of tension than the horse-hair cushions. These cushions, which are represented in the accompanying figure, 388, consist of a flat piece of wood well planed, and pressed against the plate by a double spring or by two screws regulated at pleasure, which is preferable. This flat piece of wood is covered with thick flexible leather, upon which a layer of tin-foil is put, and lastly, upon this a piece of taffetas *a*, which extends a little

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way beyond the rubber on the side from which the motion proceeds. It is this taffetas which rubs against the glass and electrises it positively, while it is itself electrised negatively. It should be covered with mosaic gold, or, still better, an amalgam of tin, zinc, bismuth, and mercury, reduced to a very fine powder.

The cushions, whatever their form, must communicate with the earth to afford an escape for the magnetic fluid, otherwise it partly combines with the positive fluid of the glass plate and neutralises it. With the leather cushions, it is generally sufficient to fasten a chain to the wooden supports on which the glass plate rests, and allow it to fall down to the bottom of the machine. With the cushions we have just described, it is usual to fasten to the supports two tin bands o, communicating at one extremity with the tin-foil which covers the rubbers, and at the other with a metallic wire D, which terminates in a gas burner or any other object calculated to afford a good communication with the ground. In this way, especially in dry weather, a remarkable amount of electricity may be disengaged.

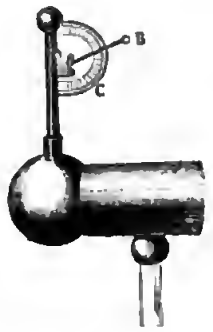
Maximum of Tension—Henley's Electrometer.—Even if we observe all the conditions just stated, the tension of the electrical machine has a limit which cannot be passed, however quickly or long we may turn the plate. This limit, when the amount of the loss is equal to the production, arises from three causes: 1, the loss through the air and its vapours, which is proportional to the tension; 2, the loss through the supports; 3, the recombination of the two electricities of the cushions and of the glass.

The tension of the electricity in electrical machines is measured by *Henley's Electrometer*, or the electrometer with a dial. It has a small electric pendulum, consisting of a piece of wood, to which a ivory dial C, fig. 389, is attached. In the centre of the latter is a small axis, round which turns a whalebone needle with a pith ball at the end B. The instrument being screwed on to one of the conductors, as represented in the figure, in proportion as the machine is charged, the needle diverges, and ceases to ascend when the maximum of tension is attained. If we then leave off turning the plate, the needle rapidly falls back in moist air, but only slowly in dry air, which shows that the loss is slight.

Secondary Conductors are large copper cylinders covered with tin plate, or made of wood and covered with tin, which are isolated by means of glass legs, or by attaching them to silk cords and then putting them in communication with the conductors o of an electrical machine, fig. 388. The surface upon which the electricity is accumulated being thus increased, the tension does not increase, but the quantity of electricity collected increases (for equal tension) in proportion to the surface. In fact, when we discharge the machine by putting it in communication with the earth, we elicit very intense sparks.

Nairne's Electrical Machine.—With the electrical machine we have described above we can only obtain positive electricity. Nairne, an Englishman, with a view to electrify invalids, invented an electrical machine which bears his name, and by means of which both electricities may be obtained at once. This machine, represented in fig. 390, is composed of two isolated conductors, which do not communicate with each other. The one has a rubber o made of leather and stuffed

Fig. 389.

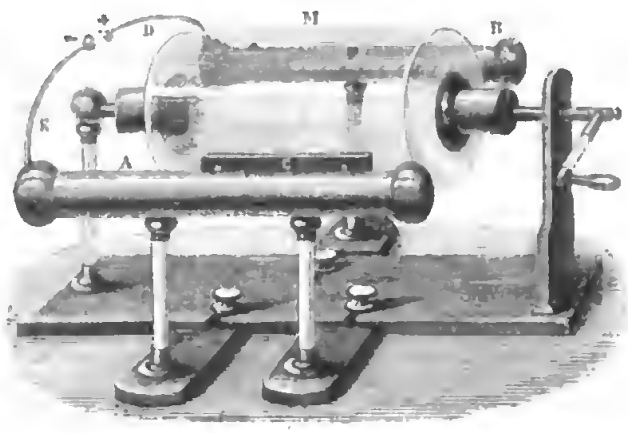


with horse-hair, and the other a comb P furnished with several spikes. Between these two conductors is a glass cylinder M, which is turned with a winch, and on one side touches the rubber and on the other passes very near the points of the spikes. On turning the glass cylinder, the rubber o and the conductor A are electrised negatively and the glass positively. Now the glass, on passing near the points on the conductor P, decomposes its natural fluid and withdraws the negative fluid, in consequence of which this conductor remains positively electrised. Two curved branches, D and E, end in two copper balls near enough to give out from them a constant series of sparks arising from the recombination of the two electricities.

Van Marum's Machine.—Van Marum constructed a machine by means of which either sort of electricity may be obtained at pleasure. For this purpose, a single conductor is employed, the points of which can be placed opposite either to the plate or the cushions, these being capable of being isolated or put in communication with the ground. When the points of the conductor are under the influence of the plate, positive electricity is obtained; but when they are under the influence of the cushions, negative electricity is procured.

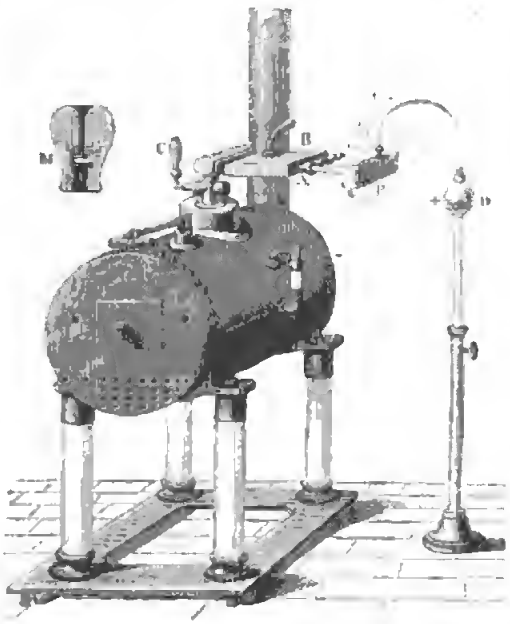
Armstrong's Hydro-electrical Machine.—This is a machine in which the development of electricity is owing to the liberation of steam through small orifices. This machine was invented by Armstrong, an English philosopher, after the discovery of a new fact which was observed in 1840, near Newcastle, in the boiler of a steam-engine. A leakage having been detected at the safety-valve, the fireman had one hand near the jet of steam, and stretched out the other to take hold of the lever of the valve, when he received a smart shock, and perceived a bright spark between the lever and his hand. Mr. Armstrong having been informed of this phenomenon,

Fig. 390.



reproduced it in other boilers, and ascertained that the liberated steem was charged with positive electricity. In experimenting upon a locomotive which he had isolated, he observed that it was electrised negatively, when the positive electricity of the steam which escaped into the atmosphere was withdrawn by the metallic points, and he thus obtained very bright sparks. He then constructed the machine represented in fig. 391.

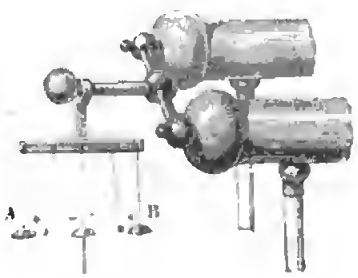
Fig. 391.



It is a sheet iron boiler, with a fire-place inside, isolated by four glass legs. Its length is about five feet, and its diameter about a foot and a half. A glass tube placed vertically on the right of the boiler, and communicating with it at both ends, indicates the level of the water inside. A small gauge, which is not represented in the figure, denotes the degree of pressure. On the boiler is a plug c, which is opened when the steam has acquired sufficient tension. Above this plug is a reservoir B, in which the tubes through which the steam escapes circulate. These tubes have other tubes, called adjutages, of a peculiar form at the end, one of which is represented on a large scale by the cut M on the left of our illustration. The interior of these adjutages is made of hard wood, curved as the arrow shows, which increases the friction. Lastly, the box B is filled with water to cool the escape tubes. The steem before reaching the adjutages is thus partially condensed, and comes forth mingled with small bubbles of water, which is a necessary condition, because the experiments of Mr. Faraday show that electricity is not obtained from the passage of dry vapour.

Electric Chime; Hail Apparatus.—The electric chime is a small apparatus composed of three bells attached to a horizontal tringle, in communication with an electrical machine, fig. 392. The bells A and B hang by metallic chains which

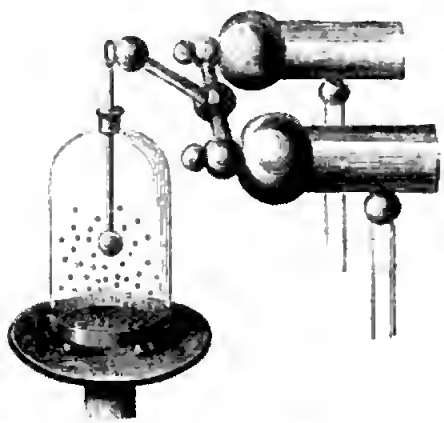
Fig. 392.



establish a communication with the triangle, while the central bell hangs by a silk thread which isolates it from the machine, but it communicates with the earth by means of a metallic chain. Lastly, between the middle bell and the two others, are two little copper balls hanging by silk threads. When the machine is charged, the bells A and B are electrised positively, attract the copper balls, and repel them as soon as contact has taken place. Now these balls being then electrised positively, approach the bell C, which, although in communication with the earth, is charged with negative electricity through the influence of the others. Directly after contact the balls are therefore repelled towards the bells A and a, and thus keep moving backwards and forwards rapidly, and striking the bells all the time the machine is charged.

To explain how hailstones attain to a considerable weight before falling, Volta invented an apparatus, founded, like the preceding, upon electric attraction and repulsion. It consists of a glass bell placed upon a copper plate, with a number of little pith balls upon it, fig. 393. Through the neck of the

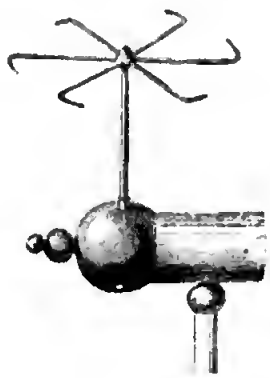
Fig. 393.



bell passes a copper rod, terminated at the lower extremity by a ball of the same metal, and communicating at its upper extremity with an electrical machine. As soon as the machine is charged, the ball in the apparatus is electrised, attracts the pith balls, and then repels them so that they dance about with great rapidity, going from the plate to the ball, and from the ball to the plate, and giving to the latter the electricity they have acquired from the ball. Guided by this experiment, Volta came to the conclusion, that when hailstones are placed between two clouds charged with contrary electricities, they go in their way successively from one to the other, and then condense at their surface the surrounding moisture, which on congealing gives them the magnitude they sometimes have; but this theory is insufficient to account for the size of hailstones, and is not generally admitted.

Electric Tourniquet.—This name is given to a small appara-

Fig. 394.

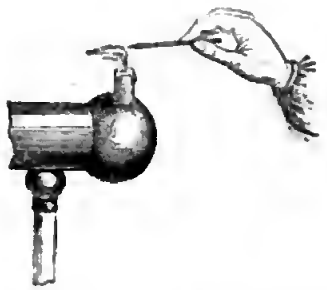


tus consisting of five or six metallic rays bent at the end, all in the same direction, each terminating in a point, and fastened to a cap which is moveable on a pivot, fig. 394. This apparatus being placed on an electrical machine, the rays revolve rapidly in the direction opposite to that of the points as soon as the machine is charged. This motion is not the effect of reaction, like that of the hydraulic tourniquet, as some philosophers have maintained, but of repulsion between the electricity of the points and that which they communicate to the air. The electric fluid collecting towards the points, escapes in the air, and as the air is then charged with the same electricity as the points, it repels them and is repelled by them.

Fig. 395.



Fig. 396.

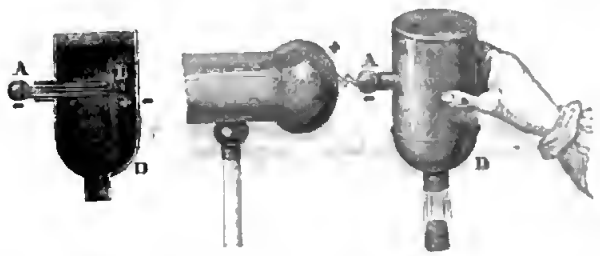


It is found that the tourniquet does not move in vacuo, and if you place the hand near it while it turns in the air, a slight current of air is felt, owing to the displacement caused by the electrised air.

When the electricity thus escapes at a point, the electrised air is repelled strongly enough to give rise to a current which is not only perceptible by the hand, but capable of blowing out a candle or wax taper with a powerful machine. Fig. 395 shows how the experiment is performed. The same effect may be obtained by placing the candle or taper on one of the conductors, and bringing a metallic point that is held in the hand near to it, fig. 396. The current in this case arises from the contrary fluid which is separated from the point by the influence of the machine.

Volta's Pistol.—This is a small apparatus which serves to show that the electric spark has the property of determining chemical combinations. It consists of a tin-plate vase, in which is placed an explosive combination of two volumes of hydrogen and one of oxygen. It is then hermetically sealed. On one side is a tubular opening, through which passes a metallic rod terminated by two small balls A and B, as represented in the cut on the left of the accompanying illustration, fig. 397, and enclosed in a glass tube which isolates it from the rest of the instrument. Holding the instrument in the hand, as shown in the figure, bring it near an electrical machine. The knob A being then electrised negatively by influence, and the knob B positively, the spark comes out between the knob A and the machine, and at the same moment a second spark appears between the knob B and the side of the vase, which communicates with the earth through the hand. It is this latter spark which determines the combination of the two gases. This combination being accompanied by a lively disengagement of heat, the steam which is produced acquires such an expansive force, that the cork is projected with great force and a loud report like that of a pistol.

Fig. 397.



LESSONS IN MORAL SCIENCE.—No. VI.

THE KIND OF INDIFFERENCE WHICH HAS BEEN CONSIDERED ESSENTIAL TO FREE AGENCY.

In every act of choice or will, it is implied that the person willing might, if he pleased, act in a different way from what he does, for otherwise he would be under a necessity of acting in one way only, and there could be no freedom in such an action. There is no freedom in the pulsations of the heart, for they are not voluntary, but go on whether we will it or not. In all actions where the will is exercised there must be at least two things which may be done. This liberty was by the ancients distinguished into two kinds, the liberty of *contradiction*, and the liberty of *contrariety*. In the first we have the choice of doing or not doing some proposed act. In the second, we have the liberty to do one thing or another, or one thing or several others. In regard to such objects of choice, there was said to be indifference, by which it was not meant that the mind was indifferent at the moment of choice. This would be a contradiction, because indifference towards an object, and the choice of an object, are opposite and irreconcilable states of mind. But the meaning was, that, abstractedly from the feelings of the agent, the contrary or different actions were indifferent. It was in the power of the agent, *if he were disposed*, to do or not do, to do this or that; but it was never understood to imply, that with the inclination in one direction a choice might be made in the opposite direction. A man may do what he pleases, but it is absurd to suppose that he can will to do what it does not please him to do.

The doctrine of a power of contrary choice, as the thing has

been now explained, is a reasonable doctrine, and in accordance with all experience, if with the volition you include the motive, if with the choice you take in the desire. But to suppose a volition contrary to the prevailing inclination is inconsistent with all experience; and, as has been shown, such a liberty or power would disqualify a man for being an accountable moral agent.

In the last century an able metaphysical writer, convinced that the common doctrine of the self-determining power of the will could not stand, invented a new hypothesis. His leading idea is, that we do not choose an object because we desire it, but desire it because we choose it. According to this view of Archbishop King, in his work on the "Origin of Evil," there must be a state of absolute indifference prior to an act of choice; for all love or attachment to an object, and all desire of possessing it, are produced by the act of the mind in choosing it. This is a complete inversion in the order of the exercises of the mind. Though recommended by high authority, and ingeniously defended by its author, it seems strange that it should have found any respectable abettors. But Dr. Watts, in his Essay on the "Freedom of the will in God and the creatures," adopts the outlines of the archbishop's scheme, and defends its principles by many arguments. This led President Edwards, in his celebrated work on the Will, to take particular pains to refute this false theory. The indifference of which he treats is that which appertains to this schema. Many, however, have been led, from an acquaintance with the work of Edwards, to suppose that the doctrine of indifference, as refuted by this great man, is common to all who maintain the opinion of the self-determining power of the will; which is far from being the case.

WHETHER MEN ARE ACCOUNTABLE FOR THEIR MOTIVES; OR WHETHER DESIRES AND AFFECTIONS WHICH PRECEDE VOLITION, HAVE A MORAL CHARACTER.

There are two maxims on this point, which we must endeavour to reconcile, as there is an apparent repugnance between them.

The first is, that every action takes its character from the motive from which it proceeds. The second is, that every moral act is voluntary, and therefore, that desires and feelings which precede volition cannot be of a moral nature. This difficulty seems to have perplexed the perspicacious mind of Dr. Chalmers; for, perceiving that our desires and affections do possess a moral character, he labours, through a number of pages, to prove that, in as far as they are such, they are influenced by the will. The truth, however, is, that many of them are uninfluenced by preceding volition, and the whole reasoning of the learned author is unsatisfactory. The true solution is to be found in the ambiguity of language. When it is asserted that all moral actions are voluntary, the meaning is, either that by actions only external actions are meant, or that under the word voluntary, the affections of the mind which precede volition are included. No act of the body can take place without an action of the will preceding it; so that the maxim is true, as it relates to external acts. But it is also true in relation to mental acts, if we give a certain degree of extension to the word "voluntary," that is, if we use it as synonymous with spontaneous. Our desires are as free and spontaneous as our volitions, and when it is said that every moral act must be voluntary, the word is used in this comprehensive sense. There is no need, therefore, to prove that our affections must have received their complexion from a preceding volition. The judgment of the moral faculty in regard to the moral character of the desires and affections, is as clear and undoubted as of the volitions. Nay, the volitions receive their moral character from the quality of the motives which produce them; so that the very same volition may be good or bad, according to the moral character of the motives by which it is produced. The volition requisite in order to pull a trigger and let off a gun, is the same, let the motive be what it may. It is a determination to perform that specific act, and if it be performed by an insane person, there will be no morality in the volition. If the same volition be put forth by a person acting in his just defence, the volition and ensuing act will be good; but if the volition to shoot a man arise from malice or avarice, the volition prompting the act will be wicked.

We do not, therefore, trace actions to their true moral source when we ascertain the volition from which they proceed; we must always go one step higher, and ascertain the motives.

When an investigation is made into the character of an act of which some one is accused, the main point, which by witnesses the court and jury wish to ascertain, is, from what motives the accused acted. According as this is determined, so is he judged to be innocent or guilty. It hence appears, that the true and ultimate source of the morality of actions, is not found in the will, but in the desires and affections. The simple act of volition, namely, a determination to do a certain act, is always the same, whatever be the motive. And to ascertain that an action proceeds from an act of will, only determines that it is the act of a particular agent, but gives us no knowledge respecting the true moral quality of the act. This will be found universally true. Two men are seen giving money to the poor; the acts are the same, and the volitions preceding the acts and prompting them are the same; and as we cannot see the heart, we naturally judge that both acts are alike good. But if it should be revealed to us, that one of the persons was influenced entirely by a love for the praise of men, and the other, by a sincere regard for the welfare of the poor, we should immediately make a wide difference between the acts, in our moral judgment. We should still be convinced, however, that the volitions leading to the acts were the same, the only difference being in the motives.

It is clear, then, that men are more accountable for their motives than for any thing else; and that, primarily, morality consists in the motives; that is, the affections.

THE DIVISION OF MOTIVES, INTO RATIONAL AND ANIMAL.

Dr. Thomas Reid, in his work on the Active Powers, endeavours to maintain his doctrine that the will is not always governed by motives, by a reference to a certain distinction. Animal motives act by a blind impulse on the will, without regard to remote consequences. Rational motives operate by the force of reasonable considerations. Dr. Reid asserts that these classes of motives are so widely different, that their influence can never be compared: that what may be the strongest of one class, may be the weakest of the other, and that the mind must determine between them.

The distinction is no doubt just. There are principles in the human constitution, which act on the will with great force, by a blind impulse. Such are the appetites and passions, and the desire of happiness, and especially the desire to escape pungent pain, at present experienced.

The appetite of hunger urges the subject of it to eat, whether it can be done lawfully and consistently with health, or not. This influence is sensibly present, and it requires some strength of purpose to resist it, when the agent is convinced that the act cannot be done with propriety. Here then is the simultaneous operation of an animal and a rational motive; and it is evident that they counteract each other, and that according to the strength of one or the other, the will is determined this way or that way. It is not true, therefore, that these different kinds of motives cannot be compared as to their affective force. The fact is, they are brought into comparison every day, and every day victories are obtained by one over the other, according to the strength or influence which they respectively possess at the moment. Hunger impels a man to eat; reason tells him that it will be injurious to health. Here is a fair trial of strength between the force of blind appetite, and a rational regard for health. If the appetite be very strong, it will require a strong resolution to oppose it. In such cases, however, appetite commonly prevails; but not without resistance. In every case of the kind, there is a trial of strength between these different motives. Suppose food to be placed before a hungry man; if there be no considerations of duty or utility to prevent, he will of course indulge his appetite. But if he should be informed that the food is poisoned, although he be still impelled by his appetite to eat, yet the love of life or fear of death will be sufficient to induce him to refrain.

Suppose, again, that the food is the property of another,

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whose consent to use it cannot be obtained. Here the moral feelings stand in the way of indulgence: and upon the comparative strength of his appetite and of the vigour of bis conscience will depend his determination. So far is it from being true then, that animal and rational motives cannot be compared, in regard to their influence on the will, that there is nothing in human life more common than the experience of the struggle for mastery between the bigber and lower principles of our nature

When it is said that the mind determines between these contending motives, it is true, but not in the sense intended. It is true that the mind determines, and of course tha volition is on one side or tha other; but this determination is not independent of the strength of the contending motives, being always in accordance with the strongest existing desires.

There is this important difference between animal and rational motives, that a sensible impulse of the former as merely feit, is not of a moral nature. The hunger of a man is no more moral than the hunger of a beast. These animal feelings are unavoidable and constitutional. The point at which sueh feelings begin to partake of a moral qnality, is when they require to be governed and directed. It was not wrong for tha hungry man when he saw bread before him to desire it. But when he knew it to be the property of another, it would have been wrong to take it; and when he knew that the food would injure him, it became his dnty to forbear.

We cannot extinguish the animal feelings by an act of the will; they arise involuntarily, and therefore eannot be in themselves of a moral nature. Yet as man has other principles and powers by which he should be governed, be becomes faulty when he neglects to govern these lower propensities in accordance with the dictates of reason and conscience. Bnt in regard to other desires and affections, they are good or bad in every degree in which they exist. For example, not only are malice and envy sinful wben ripened into act, but the smallest conceivable exercise of such feelings is evil; and as they increase in strength, their moral evil increases. It does not require an act of volition, consenting to these feelings, to render them evil; their very essence is evil, and is condemned by the moral sense of mankind.

WHETHER MORALITY BELONGS TO PRINCIPLES AS WELL AS ACTS, OR IS CONFINED TO ACTS ALONE.

It seems to be generally agreed, that in the buman soul there exist certain principles from which actions proceed, as streams from a fountain; and that the character of the actions corresponds with that of the principle. Tbose, however, who maintain that the will possesses e self-determining power, independent of motives, deny tbe existence of any such principles lying at the root of the acts of the mind, especially in moral exercises. They hold that the evil of an act arises entirely from the exercise of free will, and that there is no propriety in referring it to any thing previously existing in the mind. They allege that nothing can be of a moral nature but that which is volnntary, and therefore that virtue or vice can be predicated of nothing but actions. They argue, however, that to make virtue and vice consist in the occult qualities of the soul, is to conceive of the essenee of the soul as corrupt; and that this would be to make sin a physical quality, existing without any relation to the will. It would be entirely out of place, here, to consider the bearing of this controversy on certain theological points, concerning whicb polemics have waged an interminable war. We have, at present, nothing to do with any principles or questions but such as may be learnt from reason and experience.

In the first place, let it be observed, that we know nothing of the soul but by its acts. We have no consciousness of anything but acts of different kinds; yet we know as certainly that we have e soul, as that we think and feel. So, also, we are not conscious of the existence of what is called disposition, temper, principle; but we as intuitively believe in the existence of these, as in the existence of the soul itself. If we see one man doing evil whenever be has the temptation, and another as habitually doing good, we cannot help considering that the one is actuated by an evil disposition whicb dwells in him, and that tbe other is influenced by a good disposition.

Wbetber moral good and evil may witb propriety be predicated of these hidden tempers of the mind, must be determined by an appeal to the common judgment of mankind; and this, we think, is manifestly in favour of the affirmative. When a man is observed to manifest wicked, malignant passions as often as occasion serves to elicit them, all men agree that he possesses a malignant temper. The soul of such a man, when his acts of iniquity are finished, cannot be free from every taint, until he again pnt forth a voluntary act. The doctrine of a uniform seriee of evil acts, is irreconcilable with the doctrine that all evil consists in self-determined acts, unless the will itself be corrupt, for why should all acts be of one kind, when no cause exists why they should be one thing rather than another? We migbt suppose such a power would act as freqnently one way as another. Bnt if there be any causes without the will, which give a uniform character to its acts, then the will cannot be free. It is determined by something without itself, which is incompatible with the hypothesis.

Again: the fountain must partake of the quality of the streams. If these are nniformly evil, it is fair to conclude that the fountain is polinted. Voluntary wickedness is nothing else than bringing into act what before existed in principle in the soul. If malice in act is sinful, surely malice in principle must be evil.

No man can bring himself to believe that the wretch wbo has perpetrated thousands of base crimes, and stands ready to commit others of the same kind, bas no evil inherent in his soul, by whicb be is distinguished from the most innocent person.

Another evidence that men do judge something to be sinful besides sinfui acts, is, that men who palpably omit important duty, are considered eqnally guilty with those who offend by positive act. That man wbo neglects to rescue a human being from death, when it is easily in his power to do so, is by all men reckoned guilty of a great crime, though he performs no act of any kind. Suppose a helpless woman or infant to fall overboard from a boat, in which there is a strong man who might afford relief, but makes no attempt to do so. Is there a person in the world who would not view such e neglect as a great sin? Now, on what principle do we censure the person who has committed no act of transgression? Evidently on the ground that he ought to have felt a regard for the life of a fellow creature. We blame his indifference to the welfare of his neighbour.

As to the maxim, that nothing is sinful whieb is not voluntary, it relates to positive acts, not to dispositions of the mind. But as was explained before in regard to desires and affections, so in regard to dispositions, we say they are in e sense voluntary. They properly belong to the will, taking the word in e large sense. In judging of the morality of voluntary acts, the principle from which they proceed is always included in our view, and comes in for its full share of the blame. Thus Bishop Butler, in his excellent essay on the "Nature of Virtue," says, in speaking of the moral faculty, "It ought to be observed that the objeet of this faculty is actions, comprehending under that name active or practical principles." This sagacious man saw that it would not do to confine virtue to positive acts, but that principles must come in for their full share of approbation or disapprobation.

The character which a man acquires by e serics of acts, is not merely the estimation of a person who has performed such acts, hut it is of a person possessing dispositions or principles which gave rise to sucb acts. Our notion of a bad man is of one who not only bas perpetrated wicked acts, but is still disposed to do the same; and we disapprove the principle as much as the acts. The notion that corrupt principles must vitiate the essence of the soul, is without foundation. The soul is the subject of many affections which are not essential to it. Natural affections may be extirpated, and yet the soul remain unchanged. Moral qualities may be entirely changed, without any change in the essence of the soul. The faculties remain, while the moral principles which govern them may be changed from good to bad, or from had to good. The same faculties whieb are employed in the performance of virtuous actions, may be occupied as instruments of wickedness. That inherent moral qualities may exist in the soul, has been the belief all nations, and is the sentiment of every common man whose judgment has not been warped by false philosophy.

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Who can believe that the soul of a cruel murderer, whose heart cherishes habitual hatred and revenge towards his fellow creatures, is, when asleep, or occupied with indifferent matters, in the same state of purity or exemption from evil, as the soul of the most virtuous man in the world? It cannot be believed. We cannot help thinking, when we see a uniform course of action, whether it be good or bad, that there must be corresponding dispositions which lead to such actions. Every effect must have an adequate cause. Let it be granted, for the sake of argument, that the self-determining power is an adequate cause for any single act of any kind; yet it can be no sufficient cause for a series of acts of the same kind. This, however, must be left to the intuitive belief of every man. It is a subject for the judgment of common sense, rather than reason.

LESSONS IN FRENCH PRONUNCIATION.

No. V.

CONSONANTS.

60. Q q.

Q, is pronounced like English K.

61. R r.

The sound of this letter is somewhat peculiar, having a rolling or jarring sound, produced by vibrating the tip of the tongue against the roof of the month, near the upper front teeth. It is never sounded in the French words MESSIEURS and MONSIEUR.

Its sound in other respects is that of English R. It is often dropped, or nearly so, in the body of a word, but especially in the last syllable, in common conversation, viz.:—

Nôtre	as if printed	Nôtr'.
Vôtre	"	Vôtr'.

But in solemn and dignified reading or speaking, it is sounded, very distinctly (when at all) with the rolling sound.

62. S s.

S, has two distinct sounds, which are determined by its position, viz:—the sharp hissing sound of S, in the English words DISSEVER and KISS; and the soft sound of S, in the English word NOSE, equivalent to the English letter Z. It has the *sharp and hissing* sound whenever it is *initial*.

It has the *soft sound*, whenever it occurs between two Vowels, viz.:—

French.	Pronunciation.	English.
Baptiser	Ba-tee-zay	*To baptise.*
Baser	Bah-say	*To base* (npon).
Choisir	Sh'wah-zeer	*To choose.*
Désordre	Day-sordr	*Disorder*
Désobéir	Day-zo-bay-eer	*To disobey.*
Maison	May-zonh!	*A house.*
Saisir	Say-zeer	*To seize.*

There are, however, a few exceptions to the above Rule. S final, before another word commencing with a Vowel or H Mute, has the sound of English Z, and is connected with the following word in pronunciation, as if it were its first letter, viz.:—

APRE'S AVOIR DINE'—as if printed—APRE ZAVOIR DINE'.
DIS A' MON'FRE'RE DE VENIR—as if printed—DI ZA' MON FRE'RE DE VENIR.
PAS EXCUSABLE—as if printed—PA ZEXCUSABLE.
VOUS AVEZ—as if printed—VOU ZAVEZ.
VOUS ETONNE'S?—as if printed—VOU ZETONNE'S?

S *final*, under other circumstances, is usually silent, viz.:—

French.	Pronunciation.	English.
Avis	A-vee	*Advertisement*
Dès	Dai	*From.*
Divers	Dc-vayr	*Various.*
Jacques	Zhahk	*James.*
Judas	Zhu-da	*Judas.*
Legs.	Lay	*Legacy.*
Os	Oh	*Bone.*
Remords	R'mor	*Remorse.*
Tamis	Ta-mee	*A sieve.*
Thomas	To-mah	*Thomas.*
Vous	Voo	*You.*

In a few words S *final* is sounded. Refer to the dictionary for these.

63. T t.

T, when *initial*, or in the *body of a word*, is usually pronounced like English T. Sometimes, however, both in the body, and in the last syllable of words, it has the sonnd of English S, in the word SEE, viz.:—

French.	Pronunciation.	English.
Cantion	Ko-seonh!	*Caution*
Démocratie	Day-mo-kray-see	*Democracy.*
Ineptie	E-nayp-see (first syll. short)	*Folly.*
Inertie	E-nayr-see (first syll. short)	*Inactivity.*
Minntie	Me-nn-see	*Trifle.*
Patience	Pa-seanhle	*Patience.*
Primatie	Pre-ma-see	*Primacy.*
Prophétie	Pro-fay-see	*Prophecy.*
Satiété	Sa-e-ay-tay	*Satiety.*

In a few other words, the T in the last syllable of TIE, TIE and TIER, has the common sound of English T. Refer to the French dictionary for their pronunciation.

T final, is usually silent, and is seldom carried to the next word in pronunciation.

64. V v.

In all situations, V has the sound of English V.

65. W w.

W, is not properly a French letter. It is not found in the French Alphabet, though it is sometimes nsed in foreign words, names of persons, places and things. When thus nsed, it has the sound of our English V. The proper name NEWTON, however, is printed in French—NEUTON; and, with the exception of the last syllable, which has the Nasal sound, the pronunciation of the whole word does not differ from its English pronunciation.

66. X x.

This letter, has different sounds in the French language, just as it has in the English. It has five different sounds, viz.:—

1. Like the English letter K in the following words, viz.:—

French.	Pronunciation	English.
Excès	Ek-sai	*Excess.*
Exception	Ek-sep-seonhl	*Exception.*
Excité	Ek-see-tay	*Excited.*

2. Like the English letters KS, in the following words, viz.:—

French.	Pronunciation.	English.
Axe	Ak-e	*Axis.*
Axiome	Ak-se-ome	*Axiome*
Axiomètre	Ak-see-o-maitr'	*Tell-tale* (naval term).
Expédier	Eks-pay-deay	*To dispatch.*
Exprimer	Eks-pre-may	*To press out.*
Extase	Eks-tahz	*Rapture.*
Extrait	Eks-tray	*Extract.*
Luxe	Luks (short u)	*Luxury.*

EX, before a Consonant, have the sound of EKS, as in the foregoing examples.

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3. Like the English letters GZ, in the following words, viz. :—

French.	Pronunciation.	English.
Exacte	Eg-zakt	*Correct.*
Exagérer	Eg-za-ahay-ray	*To exaggerate.*
Exaltar	Eg-zal-tay	*To exalt.*
Exécrable	Eg-zay-krabl'	*Execrable.*
Exode	Eg-zod	*Exodus.*
Exorde	Eg-zord	*Beginning.*

4. Like English SS in the following words, viz. :—

French.	Pronunciation.	English.
Dix	Deess	*Ten.*
Six	Seess	*Six.*
Soixante	S'wah!s-sanh!t	*Sixty.*

5. Like English Z, in the following words, viz. :—

French.	Pronunciation.	English.
Deuxième	Duh!-zee-aim	*Second.*
Dix-huit	Dee-zweet	*Eighteen.*
Dixième	Dee-zee-aim	*Tenth.*

X *final*, is silent in many words, except Proper Names.

X *final*, when carried to the next word in pronunciation, has the sound of English Z, viz. :—

AUX HOMMES	as if printed	AUZ HOMMES.
DOUX ET	"	DOUZ ET.
JALOUX ET	"	JALOUZ ET.
VOIX EN	"	VOIS EN.

67. Z a

Z, is usually sounded like English Z.

Z *final*, before a word commencing with a Consonant, is silent.

Z *final*, before a word commencing with a Vowel or H mute, is carried to the next word in pronunciation, as if it were its first letter, viz. :—

ESSAYEZ EN	as if printed	ESSAYE-ZEN.
LAISSEZ UN	"	LAISSE-ZUN.
SONGEZ A	"	SONGE-ZA', etc.

COMPOUND VOWELS.

68. There are SEVEN COMPOUND VOWELS, viz. :—

AI AU EAU EI EU OI and OU, whose different sounds we now proceed to illustrate.

AI.

Name. Sound.

AY Like the letters AY, in the English word DAY.

French.	Pronunciation.	English.
Ai	Ay	*Have.*
Aimer	Ay-may	*To love.*
Aurait	O-ray	*Would have.*
C'onnais	Ko-nay	*Know.*
Dirai	De-ray	*Shall say.*
Fait	Fay	*Fact.*

When the last letter I of the Compound Vowel AI, is under the Circumflex Accent, thus—AÎ—the character of its sound is not materially changed from that illustrated above ;—it is merely prolonged.

AU.

Name. Sound.

O. Like the letter O, in the English word NO.

French.	Pronunciation.	English.
Auprès	O-prai	*Near.*
Aussi	O-see	*Also.*
Faute	Fote	*Fault.*
Fraude	Frode	*Fraud.*
Gauche	Goshe	*Left-hand.*
Pauvre	Povr' (long o)	*Poor.*
Rauque	Roke	*Hoarse.*
Saut	So	*Jump.*

EAU.

Name. Sound.

O. Like the letter O, in the English word NO.

French.	Pronunciation.	English.
Bateau	Ba-to	*Boat.*
Chapeau	Sha-po	*Hat.*
Beau	Bo	*Fine.*
Cadeau	Ka-do	*Gift.*
Eau	O	*Water.*
Gâteau	Gah-to	*Cake.*
Nouveau	Noo-vo	*New.*
Organeau	Or-ga-no	*Iron ring.*
Troupeau	Troo-po	*Herd.*

EI.

Name. Sound.

AY. Like the letters AY, in the English word DAY.

French.	Pronunciation.	English.
Cheik	Shayk	*Sheik.*
Eider	Ay-dair	*Eider-duck.*
Meiatre	Mayatr'	*Mainmast.*
Neige	Nayzh	*Snow.*
Peine	Payn	*Pain.*
Reine	Rayn	*Queen.*
Seine	Sayn	*Draguet.*
Sereine	S'rayn	*Placid.*
Treize	Trayz	*Thirteen.*
Veine	Vayn	*Vein of marble.*

When E and I stand together, and the E is accented thus—ÉI—they are no longer a Compound Vowel ;—but each letter has its own distinct Vowel sound.

EU.

Name. Sound.

UH! Like the E Mute or unaccented, which has been already explained, except when it is a Verb, or commences a verb ; in which latter case, it has the sound of French U, which also has been explained.

French.	Pronunciation.	English.
Demeure	D'muh!r	*Residence.*
Eux	Uhl	*Them.*
Fleur	Fluhlr	*Blossom.*
Heureux	Uhl-ruhl	*Happy.*
Heure	Uh!r	*Hour.*
Jeune	Zhuh!n	*Young.*
Leur	Lnh!r	*Their.*
Milieu	Me-le-uh!	*Middle.*
Peuple	Puh!pl'	*People.*
Pleu-vait	Plnh!-vay	*To rain.*
Plusieurs	Plo-ze-uh!r	*Many.*
Veuve	Vnhv!	*Widow.*

Sometimes the U of this combination is under a Circumflex Accent, thus—EÛ—in which case the sound of the Compound Vowel is prolonged.

The correct sound of this Compound Vowel is no more difficult to be acquired, than is the correct sound of E Mute or unaccented. But it often happens that the letter or combination of letters which immediately *follows it*, adds vastly to the difficulty of pronouncing it. Bring the lips nearly together ovally, in speaking this Compound Vowel. Practise patiently and thoroughly upon the above and other Examples, until you are satisfied you have mastered the difficulty.

OI.

Name. Sound.

OAH or WAH. Like the letters OAH, of the Proper Name NOAH. Do not give this Compound Vowel the sound of WOR, or OO-AWE, as is too commonly done.

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French.	Pronunciation.	English.
Ardoise	Ar-doahz	*Slate.*
Audtnoire	O-di-toahr	*Assembly.*
Avoir	A-v'wahr	*To have.*
Bois	B'wah	*Wood.*
Désespoir	Day-zes-p'wahr	*Desperation.*
Histoire	Is-t'wahr (trill the r)	*History.*
Manoir	Ma-n'wahr	*Manor.*
Noir	N'wahr	*Black.*
Pouvoir	Poo-v'wahr	*To be able.*
Roi	R'wah (trill the r)	*King.*

OU.

Name. Sound.

OO. Like the letters OO in the English word MOON.

French.	Pronunciation.	English.
Bouleversé	Bool-ver-say	*Distracted.*
Coup	Koo	*A blow.*
Douche	Doosh	*Douche* or *Bath.*
Fouet	Foo-ay	*A whip.*
Où	Oo	*Where.*
Oubli	Oo-blee	*Forgetfulness.*
Pour	Poor (trill the r)	*For.*
Pourri	Poo-ree	*Rottenness.*
Route	Roote (trill the r)	*A route.*
Tout and Toute	Toote	*All.*
Toucher	Too-shey.	*To touch.*
Tour	Toore	*Journey.*

LESSONS IN GREEK.—No. LII.

By John R. Beann, D.D.

The Tenses of the Verb.

Every act has a relation to time. Time is conceived of in three ways—the present, the past, the future. Tense, as corresponding to time, must have the same divisions, though in some languages the tenses do not fully correspond to the three modifications of time; for instance, in English though we can express future time, we have not a future tense.

The exact import of the tenses appears best in the indicative mood.

If you conceive of time in the present, you have the condition (or action) of the verb as taking an actual shape, the present; as completed, the perfect; as coming on, the periphrastic future, formed by μελλω and the infinitive.

If you conceive of time in the past, you have the condition of the verb as taking an actual shape, the imperfect; as completed, the pluperfect; as coming on, the periphrastic future, formed by ἐμελλον and the infinitive.

If you conceive of time in the future, you have the condition of the verb as taking an actual shape, the ordinary future; as completed, the future perfect or third future; as coming on, the periphrastic future, formed by μελλησω and the infinitive.

The present indicates that the action or condition of the verb is forming, or realising itself; it consequently denotes continuance, and gives the idea in a general and unlimited manner; thus

Παντα τα αγαθα διδωσιν ὁ Θεος

God gives all good things.

In narrative the writer often transfers past events to present time, and relates them as if now actually proceeding. This is called the *historic present* (præsens historicum). The historic present gives a liveliness to the style, and is common with the Greek authors.

When a past event may in itself or in its consequences be considered as coming down to the present, by the present is the event often spoken of by the Greeks. Thus we find in the present ακουω, πυνθανομαι, μανθανω, γιγνωσκω, though this use is not limited to these verbs, *e.g.*

Θεμιστοκλεα ουκ ακουεις ανδρα αγαθον γεγενσθαι;

Do you not hear (for have you not heard) that Th. was a good man?

Ἡκω, *I have come*; and οιχομαι, *I have left*, are regularly used in a kind of perfect signification, while many other verbs, besides their ordinary meaning, have an import which can be best Englished by a perfect, as φευγω, *I flee, I have been accused, I have been banished*; νικω, *I conquer, I am a conqueror*, that is, *I have conquered*; ἀδικω, *I am in the wrong, I have failed.*

Future events also may be spoken of as present, while an additional degree of certainty is given to them. Especially are ἐρχομαι and πορευομαι thus used. Εἰμι is regularly employed with a future signification.

The perfect presents the action or condition of the verb as completed in regard to the present; the pluperfect presents the action or condition of the verb as completed in regard to the past. The use of both tenses, however, undergoes in Greek a considerable limitation by means of the aorist.

As the conclusion of an act has commonly a result, the perfect, which denotes the conclusion, may denote also the result. And, as the result, if a completed act comes down to or near the present, so the perfect may signify that which is, or that which lately was; *e.g.*

Των ποιητων τινες ὑποθηκας ὡς χρη ζην καταλελοιπασιν

Some of the poets have left directions how we ought to live.

They have left them, and here they are; thus the perfect has the force of a present. Hence this form has been called "a present-perfect," being past in act but present in consequence. In English this "present-perfect" is represented by the compound *have left, have written*, etc., and by the use of *have* is distinguished from the simple past, as *left, wrote.* The two ideas, namely, the past indefinite (in Greek the aorist), and the present-perfect may be exemplified in these words—"God *made* the world and *has* thereby *left* us a visible demonstration of his existence and glory." In Greek this use of the perfect is common. Accordingly the perfect signifies the result of the action of the present, and is sometimes best represented in English by another verb; thus κεκτημαι, *I possess*, as expressive of the result of κταομαι, *I acquire*; οιδα, *I know*, the result of εἰδω, *I see*; so μεμνημαι, *I remember*; δεδοικα (or δεδια), *I fear*; πεφοβημαι, *I am afraid*; τεθνηκα, *I am dead*; γεγαμηκα, *I am married*; ἑστηκα, *I stand*; πεφυκα, *I am*; εγρηγορα, *I watch*; πεποιθα, *I trust*; τετιμημαι, *I am held in honour*; κεκλημαι, *I am called.* As the perfect in these verbs has the force of a present, so the pluperfect has the force of a simple past or an imperfect; thus ἐκεκλημην, *I was called*, or *I bore the name*, ἠδειν, *I knew.*

The imperfect represents the action or condition of the verb as forming itself in the past, and so describes a past event in its progress and continuance in time. For narrative in which past events are set forth without regard to their continuance, the imperfect was not used by the Greeks, who employed for that purpose the aorist. In cases in which the imperfect appears in narratives, it represents the action as one on which the mind dwells in contemplation. The imperfect may thus denote continuance, an habitual state, as well as repetition, in the past. Even permanent conditions which seem best expressed in the present, are sometimes expressed by the Greeks in the imperfect, especially if the context relates to past time. The imperfect may also be used when reference is made to a past conclusion.

The aorist presents the action or condition of the verb as belonging to the past, in such a manner that its beginning and its end are at one point, and consequently the aorist simply sets forth an event as past without extension or limitation. On this account the aorist is specifically the narrative tense; the tense for reporting events as so many vanishing points in past time. The corresponding English tense is the simple preterit or the past, as *he read, they gave.* If during the narration, events are spoken of in their continuance, the imperfect is employed in Greek; and if events are introduced with their consequences in the present, then the perfect is used; *e.g.*

Aorist	Οἱ	Ἑλληνες	ενικησαν	τους	Περσας
	the	Greeks	*conquered*	the	Romans.
Perfect	Ὁ	πολεμος	ἁπαντων	ἡμας	απεστερηκεν
	the	war	*has deprived*	us	of every thing.

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In propositions which in English set forth general truths or facts which arise from common experience, the Greeks also employ the aorist to indicate a single fact or observation; *e.g.*

Πολλα ανθρωποις παρα γνωμην επεσε
Many things happen to men contrary to their expectation.

A present transaction may in Greek be put in the aorist to represent it as already over and done. This takes place chiefly in questions and brief expressions made by the subject respecting his own determinations; as εγελασα, *I laughed*, that is, *I must laugh*; εδακρυσα, *I cannot help weeping*; τί ουκ απῆλθες, *why are you not gone?*

The participle of the aorist has the force of a preterit. But the subjunctive, the optative, the imperative, and the infinitive of the aorist are used so as to represent the act as a single event or past from continuance in time or space, while the corresponding forms of the present exhibit the same act or condition in its progress and continuance; *e.g.*

Χαλεπον το ποιειν, το δε κελευσαι ῥᾴδιον
Doing is hard, to give a command easy.

The future declares that the action or condition will take place in time to come. The periphrastic future, formed with parts of μελλω and the infinitive present, future, or aorist, is to be distinguished from the simple future. The latter is a future indefinite, merely declaring that an act will take place or a condition arise at some future moment; while the former is a future with a limitation, denoting that the circumstance will occur in relation to some other time, either immediately in the present, or after another future event. The simple future, or the future formed by adding a termination to the stem, as representing a thing that will be, may denote an event that is to be, or must be; so it comes to signify a request or convey a command, especially in questions with ου.

The future may also express that which is conformable to the character of the subject, that which may be expected from the subject, as

Ὁ δικαιος ανηρ ευ βιωσεται, κακως δε ὁ αδικος
The just man will live well, but the unjust ill.

After verbs signifying to promise, to wish, to request, to hinder, to swear, to expect, to hope, &c., the Greeks use either the infinitive future, or the infinitive present, or the infinitive aorist.

The perfect future or third future denotes a condition or an action which is considered as completed in the future, *e.g.*

Ματην εμοι κεκλαυσεται
In vain shall I have wept.

This third future is used also to indicate a continuous future condition, and serves therefore as the ordinary future to verbs which in the perfect have a present signification; *e.g.*

Αει της σης φιλιας μεμνησομαι
Always will I remember thy friendship.

Exercises.—Greek-English.

Πολλων κακων ανθρωπεις αιτιος εστιν ὁ πολεμος. Τα κακον ενδεποτε γιγνεται αγαθον. Διονυσον τικτει ποθ' ἡ Καδμου κορη. Οἱ εν Σικελιᾳ Αθηναιοι και Ῥηγῖνοι τριακοντα νανσι στρατευουσιν επι τας Αιολου νησους καλουμενας. Αρτι γιγνωσκεις τοδε, ὡς πας τις αὐτον μᾶλλον του πελας φιλεῖ; Αρτι ἡκεις, ἡ παλαι; Ουκ αποδεδρακασιν οἱ φυγοντες· οιδα γαρ ὑπ' οιχονται. Κολαζονται οἱ ανθρωποι οὐς αν οιωνται αδικειν. Εν ταις δυσπραξιαις ἡμιν επιδεικτεον εστιν, ὁτι των αλλων αμεινον τεθραμμεθα και πεπαιδευμεθα προς αρετην. Ὀργς ὁσοι μεν οἰκοι ἰδιωτῶν εισιν ηνξημενοι απο πολεμου, ὁσοι δε τυραννων. Εν τοις Δρακοντος νομοις μια ἁπασιν ὡρισται τοις ἁμαρτανουσι ζημια, θανατος. Πεμπτῳ ετει του πολεμου οἱ Πελοποννησιοι εδῃωσαν τῆς Αττικῆς τα τε προτερον τετμημενα και ει τι εβεβλαστηκει και ὁσα εν ταῖς πριν εσβολοῖς παρελελειπτο. Ὁ κρατων ἁμα παντα συνηρπακε. Ου βουλευεσθε ὡρα, αλλα βεβουλευεσθαι. Εν εκεινῳ τῳ καιρῳ, ὁτε πᾶσι δουλειαν επεφερεν ὁ βαρβαρος, οἱ Θεβαῖοι μετ' αυτου ησαν. Αγησιλαος τα θεια ὁυτως εσεβετο, ὡς και οἱ πολεμιοι τους εκεινου ὁρκους και τας εκεινου σπουδας πιστοτερας ενομιζον ἡ την ἑαυτων φιλιαν. Αφικοντο επι τον ποταμον, ὁς ὡριζε την τε των Μακρωνων και την των Σκυθινων χωραν. Ὁ Χαλος ποταμος πληρης ην ιχθυων μεγαλων και πραεων, οὐς οἱ Συροι θεους ενομιζον. Ου τοῦτ' ην ευδαιμονια, κακου απαλλαγη. Αληθες αρα ην το εἰναι το αδικεῖν του αδικεῖσθαι κακιον. Οἱ Αθηναῖοι Περικλεῖ ανεπειθοντο τε και εξεκομιζοντο εκ των αγρων παῖδας και γυναῖκας και την αλλην κατασκευην, ἡ κατ' οἶκον ιχρῶντο· προβατα δε και ὑποζυγια εις την Ευβοιαν διεπεμψαντο. Δαρεῖος μετα Κομβυσην Περσων εβασιλευσεν. Διενειμαντο την αρχην ὁ Ζευς και ὁ Ποσειδων και ὁ Πλουτων, επειδη παρα τοῦ πατρος παρελαβον. Ὁ πολεμος ἁπαντων ἡμας απεστερηκε· και γαρ τοι πενεστερους πεποιηκε, και πολλους κινδυνους ὑπομενειν ηναγκασε, και προς τους Ἑλληνας διαβεβληκε, και παντας τροπους τεταλαιπωρηκεν ἡμας. Αἱ πλεῖσται πολεις προσταττουσι μη κλεπτειν, μη ἁρπαζειν, μη απιθεῖν αρχοντι και ταλλα τα τοιαῦτα· ην δε τις τουτων τι παραβαινῃ, ζημιας αυτοῖς επιθεσαν. Ουχι συγε αυτικα μαλα ευδαιμων εγεινου και επι ευδαιμονα επεπησας; Απεπτυσα τοιαυτην συγγενειαν. Πολυ ῥᾴον εστι φυλαττειν χρηματα ἡ κτησασθαι. Επειδαν ἁπαντα ακουσητε, κρινατε, μη προτερον προλαμβανετε. Παυσαι ενν ἡδη, μηδ' ερωτησῃς πεῖρα. Ευ τυχοις και τυχοις ὁσων ερᾶς. Δικαια ἐρασας συμμαχον τευξει θεον. Ὡς αληθη οντα λεξω σοι ἁ μελλω λεγειν. Δεησει αγαθοῦ αει επιστατου, ει μελλει σοι ἡ πολιτεια σωζεσθαι. Κλεαρχαν λεγειν εφασαν ὡς δεοι τον στρατιωτην φοβεῖσθαι μαλλον τον αρχοντα ἡ τους πολεμιους, ει μελλοι ἡ φυλακας φυλαξειν ἡ απροφασιστως ιεναι προς τους πολεμιους. Οἱ εις την βασιλικην τεχνην παιδευομενοι τί διαφερουσι των εξ αναγκης κακοπαθουντων, ει γε πεινησουσι και διψησουσι και ῥιγωσουσι και αγρυπνησουσι; Ου μ' εασεις; Εξεις ατρεμας. Ανηρ σοφος τας εν τῳ βιῳ συμφορας ῥᾴον οισει των αλλων. Ὑπισχετο ευ ποιησειν ἡμας. Εξεπεσαν οἱ Κορινθιοι των Μεγαριων νανσι σφᾶς συμπροπεμψειν. Οἱ Αθηναῖοι εφευντο της Σικελιας αρξειν. Πανταχον εν τῇ Ἑλλαδι νομος κεῖται τους πολιτας ομνυναι ὁμονοησειν. Τους χρηματισμους τους παρα το δικαιον γιγνομενους ἡγεῖσθαι μη πλοῦτον αλλα κινδυνον ποιησειν. Εν Ἀιδου εσομεθα ταληθες. Κι τινα αλληλοις μαχην συναψετε, νομιζετε εν τρὶ τῃ ἡμερᾳ εμε τε κατακεκοφεσθαι και ὑμᾶς ου πολυ ὑστερον. Ουκ, επειδαν ἡμεις τελευτησωμεν, οἱ λογοι οἱ περι ἡμων σεσιγησονται.

English-Greek.

They hold their peace. They will hold their peace. They are about to hold their peace. They will have held their peace. They have held their peace. They hold their peace. They were holding their peace. They had held their peace. War and battle are the causes of evil to the world. They have been banished. They will be banished. Those men acquire property. These women possess much property. My brother is married. Those citizens are accounted wise. Laws exist in Greece which command all the citizens to be of one mind. Good citizens desire to be of one mind. Alexander conquered Darius and reigned in his stead. Socrates taught the young men of Athens virtue, and was condemned to death. Those boys have been taught music, but cannot sing. Draco affixed one punishment to all offences, namely, death. The enemy will lay waste what things were left in the former invasion. I have been brought up in adversity. Thy sister has been well educated, and sings beautifully. This is the time to do (for action, to have done), and not to consult. They persuade. They trust. He was persuading. He trusted. Trusting in friends I have come hither. They will go. They went away in flight. They will go away in flight. He remembers my friendship. They will remember thy friendship. Good men will live well (happily), bad men unhappily. It is not so easy to do as to command. They commanded, but they do not.

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They were commanding. They have commended. I commanded. He commanded the boy to learn well.

VOCABULARY, REMARKS, AND QUESTIONS.

Πελας, adverb, *near*; ὁ πελας, *your neighbour*.
Αποδιδραασκω, *I run away from*.
Τρεφω, *I am arrested, brought up*.
Αυξαγω, *I increase*.
Ὁριζω, *I set a limit or boundary*; ὁρος, *a limit, a mountain*.
Δηϊοω and ἐργω, *I lay waste*; δηϊος, *hostile, like an enemy*.
Ὁ κρατων, etc., *he who has become master, has thereby seized*, that is, *he now possesses, all*.
Ιχθυς, υος, ὁ, ιχθυν, ιχθυες, dec. pl. ιχθῦς.
Πρᾷϋς and πρᾶος, neut. pl. πρεα, gen. pl. πρεων, *tame, tender*.
Ταλαιπωρεω, *I make wretched*; ταλαιπωρος, *wretched*.
Πτυω, *I spit*; αποπτυω, *I refuse contemptuously*.
Ει γε πεινηασουσι, *since they hunger and thirst*, etc.
Ου μ' εασεις, *let me alone*; compare the colloquial phrase, won't you have done?
Ατρεμας (α and τρεμω), adverb, *quietly*, here "be quiet."
Ὁμογνοεω (ομος and γνως), *I am of one mind, I agree*.

Why is γιγνωσκεις in the present tense? What is the tense of ἠκεις, and why? Why is αποδεδρακασιν in the perfect tense? What is the meaning of the present perfect? What is the exact meaning of the aorist? How does the aorist differ from the perfect? from the imperfect? When is the present tense used to describe a past event? What is the meaning of the term "historic-present?" What is the meaning of κεκτημαι? How does it get that meaning? of οιδα? of γεγηθεα? State the significations of the simple future; of the future formed by μελλω; of the third future. What are the person, mood, and tense of each of the following forms, and why are the verbs in these forms; namely, ὡρισε; εἐργασαν; εβεβλαστηκει; παρελελειπτο; συνηρπακε; βεβουλευσθαι; εσεβετε; ενομιζεν; ὡριζε; εασεις; ποιησειν; αρξειν; κατασκοψεσθαι?

What is the exact force of the present? of the imperfect? of the pluperfect? Into what divisions may time and tense be divided? What relation has tense to time?

What are the chief modifications of meaning borne by the middle voice? How does the middle voice differ from the passive voice? What tenses have no exclusively passive signification? Is the exclusiveness without restriction?

LESSONS IN ITALIAN GRAMMAR.—No. XXXVIII.

4.

Náscere, to be born.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *náscere*, to be born.	Past: *éssere náto*, to have been born.
Present Gerund: *nascéndo*, being born.	Past Gerund: *essèndo náto*, having been born.
Past Participle: *náto*, been born.	

INDICATIVE MOOD.

Present.	Indeterminate Preterite.
Náscо, I am born	*Nácqui*, I was born
náschi, thou art born	*nascésti*, thou wast born
násce, he is born	*nácque* or *nascéo*, he was born
nasciámo, we are born	*nascémmo*, we were born
nascéte, you are born	*nascéste*, you were born
náscono, they are born	*nácquero*, they were born
Imperfect.	**Future.**
Nascéva, I was born	*Nascerò*, I shall or will be born
nascévi, thou wast born	*nascerái*, thou wilt be born
nascéva, he was born	*nascerà*, he will be born
nascevámo, we were born	*nasceremo*, we will be born
nascevéte, you were born	*nascerète*, you will be born
nascévano, they were born	*nascerànno*, they will be born

Conditional Present.	Conditional Past.
Nascerèi, I should or would be born	*nascerébbe* or *nascería*, he would be born
nascerésti, thou wouldst be born	*nascerémmo*, we would be born
	nascerésto, you would be born
	nascerébbero, *nascerían*, or *nascerían*, they would be born

IMPERATIVE MOOD.

[No First Person.]	
Náscі, be (thou) born	*nasciámo*, let us be born
náscа, let him be born	*nascéte*, be (ye or you) born
	náscano, let them be born

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che náscа, that I may be born	*Che nascéssi*, that I might be born
che náscа or *náschi*, that thou mayst be born	*che nascéssi*, that thou mightst be born
che náscа, that he may be born	*che nascésse*, that he might be born
che nasciámo, that we may be born	*che nascéssimo*, that we might be born
che nasciáte, that you may be born	*che nascéste*, that you might be born
che náscano, that they may be born	*che nascéssero*, that they might be born

So conjugate—

Rinàscere, to be born again.
Soprannàscere, to spring on, or after something.

5.

Nuócere, to hurt.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *nuócere*, to hurt	Past: *avére nociúto*, to have hurt
Present Gerund: *nocéndo* or *nuocéndo*, hurting	Past Gerund: *avéndo nociúto*, having hurt
Past Participle: *nociúto*, hurt	

INDICATIVE MOOD.

Present.	Indeterminate Preterite.
Nuóco, I hurt	*Nócqui* or *nuócquero*, I did hurt
nuóci, thou hurtest	*nocésti* or *nuocésti*, thou didst hurt
nuóce or *nóce*, he hurts	*nócque*, he did hurt
nocciámo or *nuocciámo*, we hurt	*nocémmo* or *nuocémmo*, we did hurt
nocéte or *nuocéte*, you hurt	*nociste*, you did hurt
nuócono, they hurt	*nócquero* or *nuócquero*, they did hurt
Imperfect.	**Future.**
Nocéva, *nocéa*, or *nuocéva*, I did hurt	*Nuocerò* or *nocerò*, I shall or will hurt
nocévi or *nuocévi*, thou didst hurt	*nuocerái* or *nocerái*, thou wilt hurt
nocéva or *nuocéva*, he did hurt	*nuocerà* or *nocerà*, he will hurt
nocevámo or *nuocevámo*, we did hurt	*nuocerémo* or *nocerémo*, we will hurt
nocevéte or *nuocevéte*, you did hurt	*nuocerète* or *nocerète*, you will hurt
nocévano or *nuocévano*, they did hurt	*nuocerànno* or *nocerànno*, they will hurt
	Conditional Present.
	Nocerèi or *nuocerèi*, I should or would hurt
	nocerésti or *nuocerésti*, thou wouldst hurt
	nocerébbe, *nocería*, or *nuocerébbe*, he would hurt
	nocerémmo or *nuocerémmo*, we would hurt
	nocerésto or *nuocerésto*, you would hurt
	nocerébbero, *nuocerébbero*, *nocerían*, or *nocerieno*, they would hurt

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IMPERATIVE MOOD.

[No First Person.]	
Nuóci, hurt (thou)	*nuocíamo*, let us hurt
nuóca, let him hurt	*nuocéte*, hurt (ye or you)
	nuócano, let them hurt

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che nuóca, that I may hurt	*Che nocéssi*, that I might hurt
che nuóca, that thou mayst hurt	*che nocéssi*, that thou mightst hurt
che nuóca, that he may hurt	*che nocésse*, that he might hurt
che nuocíamo or *nociámo*, that we may hurt	*che nocéssimo*, that we might hurt
che nuociáte or *nociáte*, that you may hurt	*che nocéste*, that you might hurt
che nuócano, that they may hurt	*che nocéssero*, that they might hurt

6.

Rilúcere, to shine

INFINITIVE MOOD.

Simple Tenses.

Present: *rilúcere*, to shine.
Present Gerund: *Rilucéndo*, shining.
[No Past Participle.]

INDICATIVE MOOD

Present.	
Rilúco, I shine	*rilucéte*, you shone
rilúci, thou shinest	*rilúsero* or *rilucérono*, they shone
rilúce, he shines	
riluciámo, we shine	Future.
rilucéte, you shine	*Rilucerò*, I shall or will shine
rilúcono, they shine	*rilucerái*, thou wilt shine
Imperfect.	*rilucerá*, he will shine
Rilucéva or *rilucéa*, I shone	*rilucerémo*, we will shine
rilucévi, thou shonest	*riluceréte*, you will shine
rilucéva, he shone	*riluceránno*, they will shine
rilucevámo, we shone	Conditional Present.
riluceváte, you shone	*Rilucerêi* or *rilucería*, I should or would shine
rilucévano or *rilucéano*, they shone	*rilucerésti*, thou wouldst shine
Indeterminate Preterite.	*rilucerébbe* or *rilucería*, he would shine
Rilússi or *rilucéi*, I shone	*rilucerémmo*, we would shine
rilucésti, thou shonest	*rilucerésto*, you would shine
rilússe, *riluté*, or *rilucéo*, he shone	*rilucerébbero*, *rilucerieno*, or *rilucerieno*, they would shine
rilucémmo, we shone	

IMPERATIVE MOOD.

[No First Person].	
Rilúci, shine (thou)	*rilucíamo*, let us shine
rilúca, let him shine	*rilucéte*, shine (ye or you)
	rilúcano, let them shine

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che rilúca, that I may shine	*Che rilucéssi*, that I might shine
che rilúca or *rilúci*, that thou mayst shine	*che rilucéssi*, that thou mightst shine
che riluca, that he may shine	*che rilucésse*, that he might shine
che rilucíamo, that we may shine	*che rilucéssimo*, that we might shine
che rilucíate, that you may shine	*che rilucéste*, that you might shine
che rilúcano, that they may shine	*che rilucéssero*, that they might shine

So conjugate—

Lúcere, to shine | *Prelúcere*, to precede with a light
Tralúcere, to shine through.

7.

Tórcere, to twist.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *tórcere*, to twist	Past: *avére tórto*, to have twisted
Present Gerund: *torcéndo*, twisting	Past Gerund: *avéndo tórto*, having twisted
Past Participle: *tórto*, twisted	

INDICATIVE MOOD.

Present.	
Tórco, I twist	*torcémmo*, we twisted
tórci, thou twistest	*torcéste*, you twisted
tórce, he twists	*tórsero*, they twisted
torciámo, we twist	Future.
torcéte, you twist	*Torcerò*, I shall or will twist
tórcono, they twist	*torcerái*, thou wilt twist
Imperfect.	*torcerá*, he will twist
Torcéva or *torcéa*, I twisted	*torcerémo*, we will twist
torcévi, thou twistedst	*torcerête*, you will twist
torcéva or *torcéa*, he twisted	*torcerânno*, they will twist
torcevámo, we twisted	Conditional Present.
torcevâte, you twisted	*Torcerêi*, I should or would twist
torcévano or *torcéano*, they twisted	*torcerésti*, thou wouldst twist
Indeterminate Preterite.	*torcerébbe*, he would twist
Torsi, I twisted	*torcerémmo*, we would twist
torcésti, thou twistedst	*torcerésto*, you would twist
tórse, he twisted	*torcerébbero*, they would twist

IMPERATIVE MOOD.

[No First Person.]	
Tórci, twist (thou)	*torciámo*, let us twist
tórca, let him twist	*torcete*, twist (ye or you)
	tórcano, let them twist

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che tórca, that I may twist	*Che torcéssi*, that I might twist
che tórca, that thou mayst twist	*che torcéssi*, that thou mightst twist
che tórca, that he may twist	*che torcésse*, that he might twist
che torciámo, that we may twist	*che torcéssimo*, that we might twist
che torciáte, that you may twist	*che torcéste*, that you might twist
che tórcano, that they may twist	*che torcéssero*, that they might twist

So conjugate—

Attórcere, to twist	*Estórcere*, to pull with violence
Contórcere, to contort	*Ritórcere*, to twist back
Distórcere, to distort	*Stórcere*, to twist

8.

Vincere, to conquer.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *vincere*, to conquer	Past: *avére vinto*, to have conquered
Present Gerund: *vincéndo*, conquering	Past Gerund: *avéndo vinto*, having conquered
Past Participle: *vinto*, conquered	

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INDICATIVE MOOD.

Present.

Vinco, I conquer
vinci, thou conquerest
vince, he conquers
vincimo, we conquer
vincéte, you conquer
vincono, they conquer

Imperfect.

Vincéva, I was conquering
vincevi, thou wast conquering
vincéva, he was conquering
vincevámo, we were conquering
vincevéte, you were conquering
vincévano, they were conquering

Indeterminate Preterite.

Vinsi, I conquered
vincésti, thou conqueredst
vinse, he conquered
vincémmo, we conquered
vincéste, you conquered
vinsero, they conquered

Future.

Vincerò, I shall or will conquer
vincerái, thou wilt conquer
vincerà, he will conquer
vincerémo, we will conquer
vinceréte, you will conquer
vinceránno, they will conquer

Conditional Present.

Vincerèi, I should or would conquer
vincerésti, thou wouldst conquer
vincerébbe, he would conquer
vincerémmo, we would conquer
vincerésteo, you would conquer
vincerébbero, they would conquer

IMPERATIVE MOOD.

[No First Person.]
Vinci, conquer (thou)
vinca, let him conquer
vincidmo, let us conquer
vincéte, conquer (ye or you)
vincano, let them conquer

SUBJUNCTIVE MOOD.

Present.

Che vinca, that I may conquer
che vinca or *vinci*, that thou mayst conquer
che vinca, that he may conquer
che vincidmo, that we may conquer
che vinciáte, that you may conquer
che vincano, that they may conquer

Imperfect.

Che vincéssi, that I might conquer
che vincéssi, that thou mightst conquer
che vincésse, that he might conquer
che vincéssimo, that we might conquer
che vincéste, that you might conquer
che vincéssero, that they might conquer

So conjugate—

Avvincere, to tie up
Convincere, to convince
Rivincere, to conquer again
Sopravincere, to conquer again
Stravincere, to get too much.

LESSONS IN SPANISH.—No. III.

OF THE ADJECTIVE.

Adjectives in Spanish have both a singular and a plural form, according as they are used with singular or plural nouns; as,

Grande hombre, large man. | *Grandes hombres*, large men.

The rules for the formation of the plural of adjectives are the same as those for forming the plural of nouns.

Adjectives which end with *on*, *an*, or *o*, and such as are derived from the names of nations, change not only from the singular to the plural, but also from the masculine to the feminine, to agree with the noun (expressed or understood) to which they belong; as,

Hombre generoso, generous man.
Muger generosa, generous woman.
Olgazan, idle (man); *olgazana*, idle (woman).
Fanfarron, bragging (man); *fanfarrona*, bragging (woman).
Español, Spanish (man); *Española*, Spanish (woman).
Ingles, English (man); *Inglesa*, English (woman).

From the examples just given, it will be seen that adjectives ending with o, change *o* into *a* to form the feminine; and that those ending with *an* or *on*, as well as those derived from the names of nations, form their feminine by adding a to the masculine.

In forming the plural of adjectives which are modified by gender, the gender must be taken into consideration first, and then the plural ending added; as,

El manso caballo, the tame horse.
Los mansos caballos, the tame horses.
La timida vaca, the timid cow.
Las timidas vacas, the timid cows.
El Ingles, the English (man); *La Inglesa*, the English (woman).
Los Ingleses, the English (men); *Las Inglesas*, the English (women).

Adjectives in Spanish are generally placed after the nouns which they qualify; though some generally come before the noun; and some can precede or follow the noun, according to the taste of the writer or speaker. Thus,

Un hombre respetable, a respectable man.
Una felicidad aparente, an apparent felicity.
Malas obras, or *obras malas*, bad works.

Remark.—In English, an adjective is sometimes allowed to come after the noun; as when we say—a verb neuter; a noun feminine; an account current; life eternal. But the rule is a far more general one in Spanish.

Some adjectives and adjective pronouns drop the final o in the masculine singular (but not in the plural), when they are placed before the noun, but never when they are placed after it. These are *uno*, a (or one); *alguno*, some; *ninguno*, none; *primero*, first; *postrero*, last; *tercero*, third; *bueno*, good; *malo*, bad; as,

Algun fruto, some fruit.
Un buen gobierno, a good government.
Un buen hombre, or *un hombre bueno*, a good man.

Santo, saint, when prefixed to the name of a male person, drops its last syllable; as, *San Pablo*, St. Paul; *San Pedro*, St. Peter. *Ciento*, hundred, when it *immediately* precedes a noun, masculine or feminine, drops its final syllable; as, *cien árboles*, hundred trees; but *ciento y dos árboles*, hundred and two trees. *Grande*, great, large, generally loses its final syllable when the noun to which it is prefixed begins with a consonant; as, *gran poder*, great power. When *grande* does not mean size or magnitude, but good qualities, *gran* is used if the noun follow it. Thus, *gran hombre* means a great man, and *grande hombre*, a large man.

Adjectives are often used without the noun (the latter being understood); as,

El pobre, the poor (man); *la pobre*, the poor (woman).
Los pobres, the poor (men); *las pobres*, the poor (women).
La derecha,[a] the right (hand).
Un ignorante, an ignorant (man).

The gender can be known by the article which precedes the adjective.

If the adjective refer to something to which we do not apply a gender, the neuter article *lo* is used; as, *lo poco*, *lo mucho*, the little, the much, or that which is little, that which is much.

In cases in which the position of adjectives would present any difficulty to the learner, the order of the words will be numbered, thus: *los hombres*[6] *magnánimos*[1] *son bienhechores del género*[3] *humano*[1]. The figures here indicate that in translating into English, *magnánimos* is to come before *hombres*, and *humano* before *género*; as, the magnanimous men are benefactors of the human race. The order in which English words must be placed in Spanish, will be indicated in the same manner when deemed necessary, thus: the[3] open[5] rebuke[4] is[2] better[1] than (the) secret[2] love[1]. Here the figures show the order in which the words should be arranged in translating into Spanish; as, *mejor es la correccion manifiesto*, *que el amor escondido*, that is, better is the rebuke open, than the affection hidden.

A sentence is rendered negative in Spanish by placing the adverb *no* (not) before the verb; as, *Juan no es sábio*, John is

[a] *Mano*, hand (feminine), is here understood.

not wise; *Pedro* no *tiene dinero*, Peter has *not* money; *María* no *tiene sed*, Mary is *not* thirsty; *Diego* no *escribió cartas*, James wrote *not* letters (or, James did *not* write letters).

Vocabulary.

Sábio, wise.
Ignorante, ignorant.
Impío, impious, wicked.
Falaz, deceitful, false.
Rico, rich.
Pobre, poor.
Bueno, good.
Malo, bad, evil.
Nuevo, new.
Inglés, English.
Español, Spanish.
Francés, French.
Amigo, friend.
Lengua, tongue, language.
General, general.
Es, is.
El Español ama, the Spaniard loves.
Y, and.
Tenebroso, dark, gloomy.
Fuerte, strong.
Robusto, robust.
Estrecho, narrow, close.
Sobérbio, proud.
Viejo, old.
Espacioso, spacious, wide.
Hermosa, beautiful, handsome.
Grande, great.
Lindo, pretty.
Dos, two.
Tres, three.
Camino, road, way.
Verdad, truth.
Ejército, army.
Son, are.
Los Españoles aman, the Spaniards love.
E', and (before *i*).

Y is used for the conjunction *and*, except before words beginning with *i* or *hi*, when *é* is used; as, *el hombre* y *la muger*, the man *and* the woman; *viejo é impío*, old *and* impious; *hijos é hijas*, sons *and* daughters.

Spanish-English.

El camino es estrecho. La casa es espaciosa. Las mugeres son sobérbias. Los Ingleses no tienen dinero. Las Inglesas no tienen hambre. Los Españoles no tienen sed. Las Americanas son hermosas. Los libros son nuevas. Un buen general es el alma de un ejército. El Frances es pobre y sobérbio. El amigo del médico es ignorante. El juez es sábio y rico. La lengua[3] falaz[1] no ama la verdad. Los Americanos aman dinero. Los hijos del pintor son fuertes y robustos. Los pobres tienen hambre.

English-Spanish.

The Frenchmen wrote letters to the Spanish-women. The Americans are friends of the English (*Ingleses*). The way of the wicked is dark. The daughters of the Spaniard (*Español*) are pretty. The books are new. The house of the physician is spacious. The horses of the Englishmen are strong. The sons of the judge are poor and proud. The daughter of the French-woman is proud and ignorant. The sisters of the painter are rich and handsome. A good man loves the truth. A false[2] tongue[1] loves not the truth. The Spaniards and the Americans love money. The silver spoons (*cucharas de plata*) are new. The road is narrow. The judge's son is bad and ignorant. The printers are rich. The physician's male servant is robust.

In Spanish proper names employed as adjectives are not generally written with a capital initial letter; thus we write, *libros españoles*, Spanish books; and not *libros Españoles*.

Degrees of Comparison.

When two things are compared, the one is equal, inferior, or superior to the other; hence there are three sorts of comparison; that of *equality*, *inferiority*, and *superiority*. Thus we may say, John is *as happy as* James; John is *less happy than* James; or, John is *more happy than* James. These adjectives are all properly in the comparative degree.

The *comparative of equality* is formed by placing *tan* (as, so) before the adjective, and *como* (as) after it; as,

El Judío es tan rico como *el Frances*, the Jew is *as rich as* the Frenchman.

Sometimes *tan* is omitted, and *como* only used; as,

Juan es fuerte como un leon, John is strong as a lion.

Cual (*qual*) is sometimes found instead of *como*. *Tan* used before an adjective, without *como*, means *so*; as, *tan grande*, so great.

The *comparative of inferiority* is formed by placing *ménos* (less) before, and *que* (than) after the adjective; as,

El Judío es ménos rico que *el Frances*, The Jew is *less rich than* the Frenchman.

The *comparative of superiority* is formed by placing *mas* (more) before, and *que* (than) after the adjective; as,

Mi madre es mas rica que *la reina*, my mother is *more rich* (richer) *than* the queen.

Mayor, greater; *mejor*, better; and *menor*, less, are already in the comparative degree, and do not require *mas* before them; as,

Los reyes son mayores que *los lores*, the kings are *greater than* the lords.

The superlative degree of the adjective expresses the quality in a *very high* or *very low*, or in the *highest* or *lowest* state; hence there are two sorts of superlatives, the *absolute* and the *relative*. Thus we may say, London is a *very large* city, or, London is the *largest city* in England.

The *superlative absolute* is formed either by placing *muy* (very) before the adjective, or by affixing the letters *ísimo* to the simple form of the adjective; as,

Útil, useful.
Muy útil, or *utilísimo*, very useful, or most useful.

If the adjective ends with a vowel, this vowel is dropped when *ísimo* is affixed; as, *grande*, great; *grandísimo*, or *muy grande*, very great; *alto*, high; *altísimo*, or *muy alto*.

Adjectives that end with *ble*, *co*, *go*, and *z*, change these letters respectively into *bil*, *qu*, *gu*, and *c*, before the suffix *ísimo*; as, *noble*, noble; *nobilísimo*, very noble; *seco*, dry; *sequísimo*, very dry; *largo*, large; *larguísimo*, very large; *feraz*, fruitful; *feracísimo*, very fruitful; or, *muy noble*, *muy seco*, *muy largo*, *muy feraz*.

ANSWERS TO CORRESPONDENTS.

L. B. (Ifants).—You will find a very interesting series of papers on the microscope in the "Youth's Educator." The object of this work (complete in 1 vol., 8vo, cloth boards, 8s.) is to place in the hands of the young a series of lessons on the most interesting and important subjects in an attractive form, divested as much as possible of those technical difficulties which so often prove insurmountable obstacles in the path of the young student. A large amount of the information contained in this work is equally adapted for adults, especially that portion of the community whose opportunities of acquiring knowledge in their youth have been circumscribed.

A Constant Reader.—Candolle was an eminent botanist, born at Geneva in 1778, died in 1841. In 1800, he was commissioned to travel over the whole of the French empire, in order to ascertain the condition of agriculture. His "Elementary Theory of Botany," his chief work ("*Theorie Elementaire de la Botanique*"), in which he sets forth the natural relations of the parts of a plant, and analyses their efficacy, was published in 1813. Dr. Candolle is the only person since Linnæus who embraced all parts of science with equal genius. He endeavoured to discover the inmost laws of being; he followed all the transformations of the organs of plants; and explained, in a happy manner, the apparent deformities or anomalies; he gained a great triumph for the natural method of arrangement, and carried classification as far as possible. At the end of his career, he reported the number of known species to be 80,000.

Latinus Discipulus: We will furnish you with the book on the receipt of the money.—F. W. H.: You will obtain the information you require by applying personally or by letter to the Registrar of the London University.—E. A: See our "Lessons in Arithmetic." 1. We can see no impropriety in the game of chess. It is a game of skill, and one of very great ingenuity. 2. About five guineas per week.—Petersat: The word *ventilation*, from the Latin "*ventus*," wind, means the art of causing wind to pass through a given space for purposes of purification; and to *ventilate* is to perform the act of ventilation.

A Young Student.—What is meant by density is the proportion of the quantity of matter in a body to its magnitude. Thus, if of two substances one contain in a given space twice as much matter as another, it is said to be twice as dense. A body is more or less dense according as its particles are near to or remote from each other; and hence it is evident that the greater the density the less the porosity, and the greater the porosity the less the density.

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ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LIX.

(*Continued from page* 86.)

EFFECTS PRODUCED BY THE ACCUMULATION OF BOTH ELECTRICITIES.

Latent Electricity; Condenser.—Latent electricity is the state of neutralisation presented by the two electric fluids when, being brought together on the surfaces of two conducting bodies, they are separated by only a thin non-conducting layer. Through this neutralisation the electric charge may become very considerable, and greatly surpass what would take place in a single body. The apparatus by which electricity is thus accumulated is called a *condenser*. There are various sorts of condensers, all based upon the principle of electrisation by influence, and consisting of two conducting bodies separated by a non-conducting body.

The condenser of Œpinus is formed of two circular copper plates A and C, and a glass plate B which separates them, fig. 399. These plates being each furnished with an electric pendulum having a conducting rod, are isolated by glass feet, capable of sliding along a groove in the stand upon which they are placed. They are thus brought near to each other or separated to any distance that may be required. To collect the two electricities on the copper plates, put them in contact with the glass plate, as in fig. 398, then by means of metallic chains make one of them, as *e. g.* A, communicate with an electrical machine and the other with the earth. The disc A is then electrised positively, like the machine, and if it were alone it would have the same quantity of electricity on an equal surface, allowing for the influence of the form; but the disc C completely changes the phenomenon, and it is that which causes the accumulation of the two electricities. In fact, the positive fluid of the disc A acting by influence through the glass on the plate C, attracts the negative fluid and repels the positive fluid into the earth. Now the negative fluid of the disc C reacts in its turn upon the positive fluid of the disc A and neutralises it, but only partially, on account of the interval between them. The electric tension on the disc A is no longer in equilibrium with the tension of the machine: the consequence of which is, that this latter communicates to the plate A fresh quantity of positive fluid, which acts as before upon the disc C, and so on up to a certain limit.

Slow and Instantaneous Discharge.—When the condenser is charged, that is to say, when the contrary electricities are accumulated on the two surfaces, the communication with the electrical machine and with the ground is broken by removing the two metallic chains. Only a part of the electricity of the plate A is then latent, while that of C is completely so. In fact the pendulum A diverges, while the pendulum C is vertical. But if we remove the plates from each other, fig. 399, both pendulums diverge, for the electricities are no longer latent.

The plates being in contact with the isolating plate, fig. 398, and the chains removed, we may discharge the condenser, that is to say, bring it back to the natural state in two ways, by a slow or an instantaneous discharge. To discharge it slowly, first touch the plate A—that is, the plate which contains an excess of electricity—with the finger, then all the positive fluid which is not made latent by the negative fluid of the disc C escapes to the earth, and as the disc C only renders latent a quantity of electricity less than its own, it is the plate C which after this first contact possesses the strongest charge; in fact, we see that the pendulum A falls back and the pendulum C diverges. If we now touch the disc C, its pendulum falls back while the pendulum A diverges, and so on if we continue touching the two discs alternately. The discharge takes place only very slowly, and if the air is dry, it is not completed until several hours have elapsed. If you first touched the plate C, which is less electrised, you would not remove any electricity from it, because all that it contains is rendered latent by the disc A.

When we wish to discharge the conductor instantaneously, we bring the two plates into communication by means of the *exciter*, an instrument consisting of two brass arcs with a ball of the same metal at the end of each, and connected together by a hinge upon which they turn. When the instrument is furnished with glass isolating handles, as in fig. 400, it is called the *glass-handled exciter*; if there are no handles, it is called the *simple exciter*. To make use of the exciter, apply one of the balls to one of the plates of the condenser, and bring the other near the second plate. A strong spark then appears, arising from the recombination of the contrary electricities accumulated on the two surfaces of the condenser. The recombination, however, is not complete, for we may in the same manner elicit a second and a third spark, and even more, though they become more and more feeble. Hence it is inferred, that when the two plates communicate together, the two electricities cannot be entirely recombined. On discharging the condenser with the exciter, we feel no sensation though we hold the exciter in the hand, and though it be the simple exciter. This is owing to the fact, that the electric fluid always choosing the best of two conductors, the recombination of the two electricities is effected by the metallic arc, and not by the body of the experimenter. But if, while touching one of the

Fig. 398.

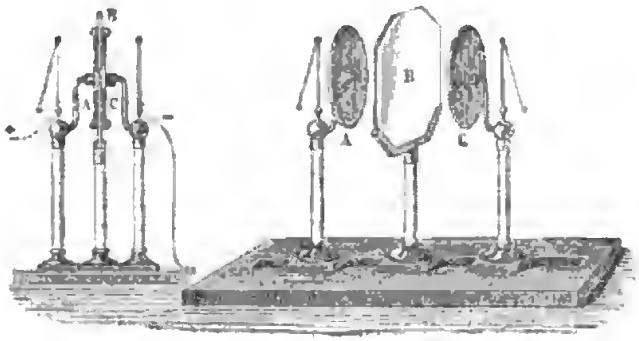
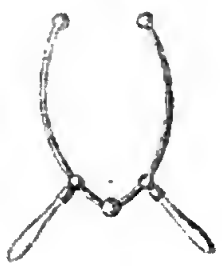


Fig. 399.

Fig. 400.



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surfaces with one hand, you bring the other near the second surface, the recombination will take place through the arms and body, and a shock will be experienced, the violence of which will be proportional to the size of the surface of the condenser and the strength of the electric charge.

Volta's Condensing Electrometer.—This is nothing else than the gold-leaf electrometer already described, with the addition of two condensing discs. The copper rod which bears the pieces of gold leaf, instead of terminating above in a brass ball, ends in a brass disc, on which is placed a piece of glazed taffeta, fig. 401, rather larger than the disc, and serving to isolate it from a second disc of a similar sort, but furnished with a glass handle and placed above it. To render even small quantities of electricities perceptible by this electrometer, bring the body whose amount of electricity you wish to determine into communication with one of the plates, which is then called the *collecting plate*, and the other plate in communication with the earth, by touching it with the finger slightly wetted, fig. 402. The electricity of the body on which you are experi-

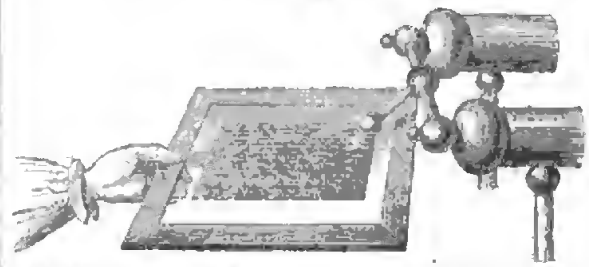
Fig. 401. Fig. 402.



menting then spreads over the surface of the collecting plate, and acts through the taffeta on the second plate and on the hand, so as to repel the electricity of the same kind to the earth and attract that of a contrary sort. The two fluids therefore collect on the two plates just as in the condenser of Œpinus, but without any divergence in the pieces of gold leaf, since the two electricities are rendered latent. The apparatus being thus charged, you may first withdraw your finger, and then the source of electricity, without as yet observing any divergence. But if you take up the upper plate, fig. 401, the electricity is no longer latent, and that of the second plate being distributed equally over the rod and over the pieces of gold leaf, these diverge very much. The divergence may be greatly increased by fitting to the foot of the apparatus two copper rods terminating in balls of the same metal, for these balls being electrised by the influence of the pieces of gold leaf, react upon them. The sensibility of the apparatus may be still further increased by removing the taffeta and separating the two plates by nothing more than a very thin layer of gum-lac varnish upon them. Lastly, instead of taking the upper plate for the collector, as in our figure, it is better to take the lower plate, because it is always the plate which communicates with the source that is most charged. Like all electric apparatus, the condensing electrometer requires to be carefully dried and even warmed before experimenting.

The Fulminating Square is a condenser more simple than that of Œpinus, and better adapted to produce lively sparks and violent shocks. It consists of an ordinary square of glass with a wooden frame round it. On the two surfaces of the glass are stuck two leaves of tin-foil opposite each other, and leaving a border of about two inches between each and the frame all round. The leaves of tin-foil do not communicate with each other, but one of them communicates with the frame by means of a small piece of tin which bends over at A, fig. 403, in such

Fig. 403.



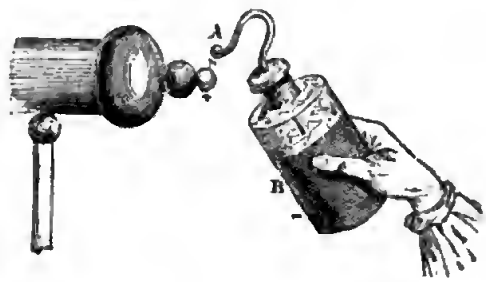
a manner that it touches the thumb of the person who holds the instrument in his hand. To charge the fulminating square, bring the isolated tin-foil—that is, the tin-foil which does not communicate with the wooden frame—near an electrical machine. As the other sheet of tin-foil is brought into communication with the earth by the hand, the two sheets act exactly like the plates of the condenser of Œpinus, and a great quantity of contrary electricities is collected on the two surfaces.

The fulminating square, like the condenser, is discharged with the simple exciter. For this purpose, hold the square in the hand, and apply one of the balls of the exciter to the extremity A of the little strip of tin belonging to the lower tin-foil. Then turning the exciter on its hinges, bring the other ball near the upper tin-foil, when a bright spark will appear accompanied by a report, owing to the recombination of the two electricities; but the experimenter will feel no shock, because the recombination takes place entirely through the metallic exciter. If, on the contrary, while holding the apparatus in the same manner, you first touch the isolated tin-foil, you will experience a violent shock, as the recombination will take place through the arms and body.

The Leyden Jar, so-called from the place where it was invented, is ascribable to Musschenbroeck, a Dutch philosopher (some say his pupil, Cuneus), who discovered it accidentally in 1746. Having fixed a metallic rod in the cork of a bottle full of water, he brought it near an electrical machine, intending to electrise the liquid. Now the hand which held the bottle performing the office of one of the plates of the condenser, while the water inside represented the other, positive fluid collected on the inner surface of the bottle, and negative fluid on the outer surface in contact with the hand. Consequently, having brought one hand near the metallic rod while the other grasped the bottle, Musschenbroeck received so violent a shock that, as he afterwards wrote to Reaumur, he would not have it again for the whole kingdom of France. However, this experiment being once known, attempts were made in all quarters to repeat it. The abbé Nollet, professor of natural philosophy at Paris, first replaced the water in the bottle by crumpled sheets of tin-foil, copper, silver, or gold. An English philosopher had already discovered that, by covering the exterior with tin-foil, the shocks might be rendered much more violent. The Leyden jar then took the form it still retains, but the theory of it was not understood till Franklin explained it by showing that, like the fulminating square, it is really a condenser.

As represented in fig. 404, at the moment of discharge, the

Fig. 404.

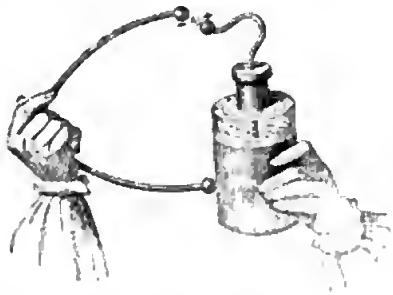


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Leyden jar consists of a thin glass bottle, varying in size according to the quantity of electricity which is required to be collected. The inside is filled with gold or copper leaf. The outside and the bottom are covered with tin-foil B, which, however, terminates at a considerable distance from the neck of the bottle. Through the cork passes a copper rod bent into a hook, and terminating in a knob A. Inside, this rod communicates with the gold or copper leaf which fills the bottle, and is called the *internal armature*, the tin-foil B being called the *external armature*.

The Leyden jar is charged, like the condenser of Œpinus and the fulminating square, by making one of the armatures communicate with the earth and the other with the electric source. For this purpose, hold it in the hand by the external armature, and present the internal armature to an electrical machine, the positive fluid then collects on the gold leaf, and the negative upon the tin-foil. The contrary would take place if, while holding the jar by the hook, you were to present the external armature to the machine. The theory of the Leyden jar is the same as that of the condenser. Like the condenser, it is discharged slowly or instantaneously. To discharge it instantaneously, hold it as in fig. 405, and bring the two

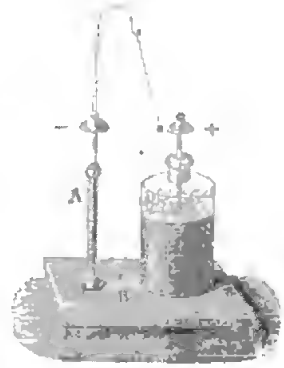
Fig. 405.



armatures into communication by means of the simple exciter, taking care first to touch the armature held in the hand, otherwise a shock will be felt. To discharge it slowly, isolate it on a cake of resin, and touch, first the internal armature, with the finger or a metal rod, and then the external armature, and so on continually, eliciting each time a feeble spark. To render the slow discharge more perceptible, arrange the Leyden jar as represented in fig. 406. The rod is straight and furnished with a small bell. Near the jar is a metallic rod with a second bell like the first, and a small electric pendulum consisting of a copper ball attached to a silk thread. The jar not being fixed to the board B on which it is placed, take hold of it by the external armature and charge it by bringing it near an electrical machine, and then put it on the board. The internal armature now containing an excess of positive electricity not neutralised, the pendulum is attracted and knocks the bell of the jar. It is then repelled immediately, and goes to the second bell, to which it communicates its electricity. But on returning to a neutral state it is again attracted by the first bell, and so on for several hours, if the air is dry and the jar large.

Jars with Moveable Armatures.—The jar with moveable armatures serves to show that in the Leyden jar and in all condensers it is not solely upon the armatures that the two latent electricities are collected, but chiefly on the surfaces of the glass that separates them. This jar, the several parts of

Fig. 406.

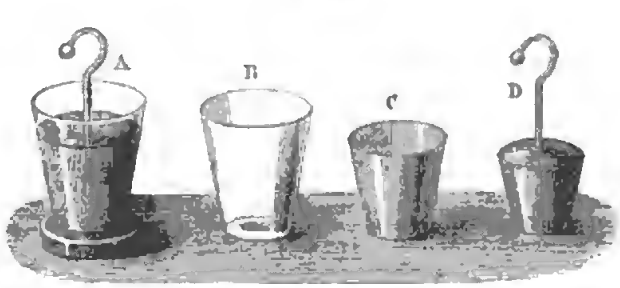


which are capable of separation, consists of a large conical glass vessel B, fig. 407, an external armature C of tin plate, and an internal armature D of the same material. These portions being placed one in the other, as represented in fig. A, form a complete Leyden jar. After having electrised it, like the common jar, and isolated it on a cake of resin, fig. A, remove the internal armature with the hand, then the glass vessel, and lastly the external armature, and arrange them all in a row as represented in the figure. Now the two armatures are evidently thus brought to the natural state. But if you put back the armature C on the cake of resin, and put the glass vessel in it, and again the armature D in this, you again form a Leyden jar, which gives a spark almost as strong as if you had not discharged the two armatures. Hence we infer that the two latent electricities, yielding to their mutual attraction, leave the two armatures in a great measure and go to the surfaces of the glass.

Cascade Charge.—This name is given to an electric charge which is transmitted from one Leyden jar to another, when they are arranged one above another as follows. The first is attached by its hook to the conductor of an electrical machine, then the hook of the second passes through a metallic ring fastened to the external armature of the first; a third is attached to the second in the same manner, and so on to the number of five or six, the external armature of the last communicating with the earth by a metallic wire. As soon as the first jar is charged, it reacts upon the neutral fluid of the second and decomposes it, then this reacts in the same way upon the neutral fluid of the third, and so on throughout till all the jars have the same fluid as the machine, and the contrary at their external armatures. These jars can be discharged one after the other, or all together, by making the internal armature of the first communicate with the external armature of the last.

Electric Jars and Batteries.—An electric *jar* is a large Leyden

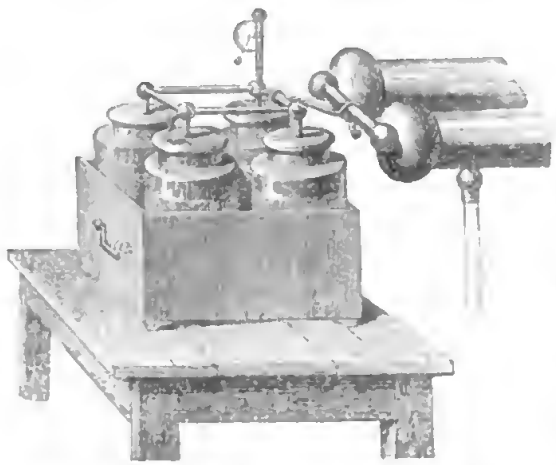
Fig. 407.



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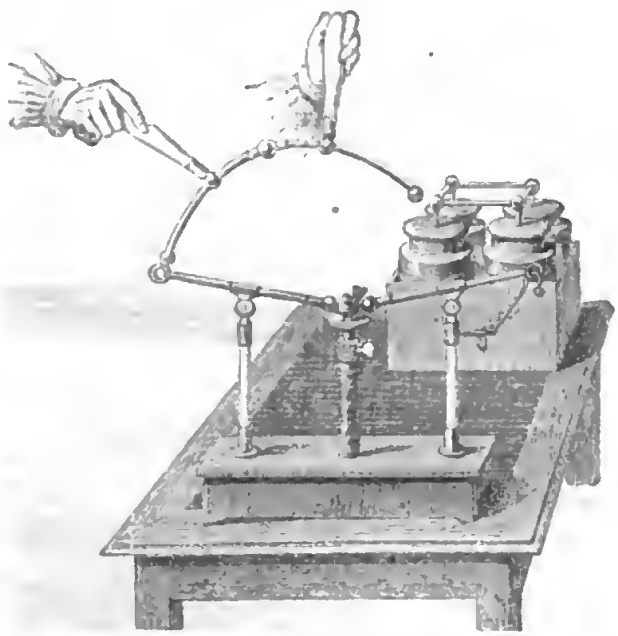
jar with a neck wide enough to enable one to stick tin-foil all round the inside for the internal armature. The rod which goes through the cork is straight, and terminates below in a metallic chain, which puts it in communication with the tin-foil that forms the internal armature. A *battery* is a collection of several jars in a wooden box, fig. 408, communicating together,

Fig. 408.



internally by means of metal rods, and externally by tin-foil which lines the bottom of the box, and is in contact with the external armatures of the jars. The tin-foil also lines the sides of the box as far as the two metallic handles. The battery is charged, as seen in the figure, by bringing the internal armatures into communication with an electrical machine, and the external armatures with the ground by the wood of the box and the table on which it rests, or, still better, by a metallic chain attached to one of the metallic handles. An electrometer with a dial fixed to one of the jars, serves to indicate the charge of the battery. In spite of the large quantity of electricity collected in the apparatus, the electrometer diverges only slowly and a few degrees, which ought not to occasion surprise, since the divergence arises solely from the difference in the tension of the two armatures. The number of jars is generally four, six, or eight. The larger and more numerous they are, the more time is required to charge the battery. To discharge it, bring the two armatures into communication by means of the exciter, taking care to touch the external armature first. We must in this case use the glass-handled exciter, and take every precaution to avoid a shock, otherwise with a strong battery serious consequences might result. When we wish to strike down an animal, or any object whatever, we make use of the *universal exciter* represented in fig. 409. It is a small wooden box with two glass columns, on which copper rods are hinged. Between these columns is a glass support with a small plate, on which is placed the animal or object upon which we wish to experiment. The two copper rods being directed towards this object, one of them is made to communicate with the external armature of the battery, and the other with one of the balls of the glass-handled exciter. Then bringing the other ball of the exciter near the internal armature, a spark appears between this ball and the armature, and another between the branches of the universal exciter. It is the latter spark that strikes the object.

Fig. 409.



LESSONS IN MORAL SCIENCE.—No. VII.

MORAL HABITS.

Habits differ from principles, or constitutional desires, in that they are adventitious. Every habit is acquired by repeated acts. The human constitution possesses a wonderful susceptibility of forming habits of every kind. Indeed we cannot prevent the formation of habits of some kind or other. Still, a man has much in his power as it regards the kind of habits which he forms, and is highly accountable for the exercise of this power. A man's happiness and usefulness depend very much on the character of his habits. Yes, a man's moral character derives its complexion, in a great degree, from his habits. In this place, it is not necessary to go into the philosophy of the formation of habits. Our object

is to consider habits and habitual actions as they partake of a moral character, or as they are the object of moral approbation or disapprobation. If we should remove from the list of moral actions all those which are prompted by habit, we should cut off the larger number of those which men have agreed in judging to be of a moral nature.

That there are virtuous habits and vicious habits, will scarcely be denied by any considerate person. A habit of lying, of swearing, of slandering, of cheating, of irreverence, of indolence, of vainglory, with many others, are, alas! too common. There are also virtuous habits, such as of industry, temperance, kindness, veracity, diligence, honesty, etc. To be sure, these virtues commonly flow from principle, but the practice of them is greatly facilitated by correct habits. Two considerations will show that men are properly accountable for those actions which proceed from habit. The first is, that in the formation of his habits man is voluntary. The acts by which they are formed are free acts, and the agent is responsible for all their consequences. The other consideration is, that habits may be counteracted and even changed by the force of virtuous resolutions and perseverance. Where habit has become inveterate, it may be difficult to oppose or eradicate it; but the strength of moral principle has often been found sufficient to counteract the most confirmed habits. When it is asserted that men long enslaved by evil habits cannot make a change, it is on the ground that no principle of sufficient power exists in the mind of the agent; but for that deficiency the man is responsible. Yet a power from without may introduce a new principle potent enough to overcome evil habits. The importance of possessing good habits is admitted by all moralists. Aristotle makes the essence of virtue to consist in "practical habits, voluntary in their origin," and agreeable to right reason. Dr. Thomas Reid, in his "Essay on the Active Powers," defines virtue to be "the fixed purpose to act according to a sense of duty," which definition Dugald Stewart modifies, by observing, "It is the fixed purpose to do what is right, which evidently constitutes what we call a *virtuous disposition*. But it appears to me that virtue, considered as an attribute of character, is more properly defined by the *habit* which the fixed purpose gradually forms than by the fixed purpose itself." Dr. Paley lays it down as an aphorism, that "mankind act more from habit than reflection." "We are," says he, "for the most part, determined at once, and by an impulse which has the effect and energy of a pre-established habit." To the objection, "If we are in so great a degree passive under our habits, where is the exercise of virtue, or the guilt of vice?" he answers, "in the *forming* and *contracting* of these habits." "And hence," says he, "results a rule of considerable importance, viz. that many things are to be done and abstained from solely for the sake of habit."

THE NATURE OF VIRTUE.

The theories on this subject have been numerous, and contrary to one another. It is now proposed to mention some of the principal of them. We shall first mention the theory of Mr. Hobbes and his followers, who deny that there is any natural distinction between virtue and vice, and maintain that by nature all actions are indifferent, and that our ideas and feelings on the subject of morality are altogether the effect of education and association. Mr. Hobbes did indeed maintain that men are bound to obey the civil government under which they may happen to live, and to conform to the religion established by law, however contrary to their own private judgment. All moral duty, according to this theory, was resolved into the authority of the law of the land. As no natural moral rule existed, it was held that, except so far as a man was restrained by civil authority, he had a right to do what he pleased; and while he confined himself within these bounds, he need feel no concern about the consequences of his conduct.

Perhaps the most extraordinary system of virtue ever promulgated was that of Mandeville, who maintained that all pretensions to virtue were mere hypocrisy, which men assumed from the love of praise. This writer forgot that hypocrisy assumes it as true that that which is counterfeited is an object of esteem and approbation among men. That virtue consists in the mere pursuit of pleasure, or of our own interest, is a system as old as Epicurus, and has had many abettors up to this time.

But the whole plausibility of their arguments depends on the pre-established connexion between happiness and a virtuous course of life. That true happiness is the natural effect of virtue, falls entirely short of proving that the essence of virtue consists in the tendency of certain actions to the person's true interest; whereas, when we perceive an action to be virtuous, we are conscious that it is not from any view of the connexion of the action with our own happiness that we approve of it; but our judgment is immediate, founded on a moral character perceived in the act itself. And in many cases virtue requires us to deny ourselves personal gratification for the sake of others. A man supremely governed by a regard to his own interest, is never esteemed a virtuous man by the impartial judgment of mankind. According to this theory, the only thing censurable in the greatest crimes is, that the guilty person has mistaken the best method of promoting his own happiness. Upon this principle, a man is at liberty to pursue his own interest at the expense of the happiness of thousands, and if he is persuaded that any action will tend to his own interest, he is at liberty to do it, whatever may be the consequences to others.

Dr. Paley adopts the principle that all virtue consists in a regard to our own happiness, taking into view the whole of our existence. His definition is, however, a very complicated one, and deserves to be analysed.

"Virtue," says he, "is the doing good to mankind, in obedience to the will of God, for the sake of everlasting happiness," according to which definition the good of mankind is the object, the will of God the rule, and everlasting happiness the motive of human virtue. If the question be asked, why we should seek the good of mankind, the answer is, from a regard to our everlasting happiness; and if the question be, why should we make the will of God the rule of our conduct, the answer must be the same; so that really all virtue is resolved into a regard to our own happiness.

Now every man desires to promote his own happiness, and according to Dr. Paley's theory, the only difference between an eminently good man and one of the opposite character is, that the one pursues a wiser course than the other; but they are both actuated by the same motives.

This theory loses sight of all intrinsic difference between moral good and evil, and admits the principle that happiness is the only conceivable good, and that anything is virtuous the tendency of which is to promote our greatest happiness.

A theory the opposite of that which makes a regard to private interest the ground of virtue, is the one which makes all virtue to consist in a regard to the public good. This is the theory of Bishop Cumberland in his work, *De Legibus*, and is not essentially different from the scheme of those who make all virtue to consist in disinterested benevolence. No doubt, much that deserves the name of virtue consists in good will to others, and in contributing to their welfare; but it is not correct to confine all virtuous actions to the exercise of benevolence. We can conceive of benevolence in a being who has no moral constitution. Something of this kind is observable in brute animals, and atheists may exercise benevolence to their friends. The indiscriminate exercise of benevolence to creatures, without any respect to their moral character, might appear to be an amiable attribute, but it could not properly be called a moral attribute. A prudent regard to our own welfare and happiness is undoubtedly a virtue. It has been considered so by the wisest of men, and we know that prudence was one of the four cardinal virtues of the heathen. As the whole is made up of parts, it is evident that if it is a virtue to promote the well-being of the whole, it must be so of each of the parts. The pursuit of our own happiness where it does not infringe on the rights of others, has nothing evil in it, but is approved by every impartial mind. Some who maintain that all virtue consists in benevolence, admit that we may seek our own happiness just as we seek that of our neighbour; but the human constitution is not formed to exercise that abstract impartiality. While we are bound to promote the welfare of our neighbour and of strangers, our obligation is still stronger to endeavour to secure our own happiness; and if a friend and a stranger stand in equal need of a benefit which we have it in our power to bestow, it is evidently our duty to consult first the welfare of our friend, other things being equal.

What Bishop Butler has said on this subject in his short treatise on "Virtue," is worthy of consideration: "It deserves

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to be considered whether men are mere at liberty in point of morals, to make themselves miserable without reason, than to make others so; or dissolutely to neglect their own greater good for the sake of a present lesser gratification, than they are to neglect the good of others whom nature has committed to their care. It should seem that a due concern about our own interest or happiness, and a reasonable endeavour to secure and promote it, is, I think, very much the meaning of the word *prudence* in our language—it should seem that this is virtue, and the contrary behaviour faulty and blameable; since in the calmest way of reflection, we approve of the first and condemn the other conduct, both in ourselves and others. This approbation and disapprobation are altogether different from mere desires of our own and their happiness, and from sorrow in missing it."

Again: "Without inquiring how far and in what sense virtue is resolvable into benevolence, and vice into the want of it, it may be proper to observe that benevolence and the want of it, singly considered, are in no sort the whole of virtue and vice. For if this were the case, in the review of one's own character, or that of others, our moral understanding and moral sense, it would be indifferent to everything but the degrees in which benevolence prevailed, and the degrees in which it was wanting. That is, we should neither approve of benevolence to some persons rather than others, nor disapprove of injustice and falsehood, upon any other account, than merely as an overbalance of happiness was foreseen likely to be produced by the first, and misery by the second. But now, on the contrary, suppose two men competitors for anything whatever which would be of equal advantage to each of them; though nothing indeed would be more impertinent than for a stranger to busy himself to get one of them preferred to the other, yet such endeavour would be virtue, in behalf of a friend or benefactor, abstracted from all consideration of distant consequences; as that examples of gratitude and friendship would be of general good to the world. Again, suppose one man should by fraud or violence take from another the fruit of his labour, with intent to give it to a third, who, he thought, would have as much pleasure from it as would balance the pleasure which the first possessor would have had in the enjoyment and his vexation in the loss; suppose that no bad consequences would follow, yet such an action would surely be vicious. Nay further, were treachery, violence and injustice not otherwise vicious than as foreseen likely to produce an overbalance of misery to society, then, if in any case, a man could procure to himself as great advantage by an act of injustice as the whole foreseen inconvenience likely to be brought upon others by it would amount to, such a piece of injustice would not be faulty or vicious at all." "The fact then appears to be, that we are constituted so as to condemn falsehood, unprovoked violence, and injustice, and to approve of benevolence to some rather than others, abstracted from all consideration of which conduct is likely to produce an overbalance of happiness or misery."

The danger of this theory is not by any means so great as that of the selfish scheme, because it comprehends a large part of actions which are truly virtuous. But all definitions of virtue which are not so comprehensive as to embrace the whole of moral excellence, are injurious; not only by leaving out of the catalogue of virtues such actions as properly belong to it, but by leaving men to form wrong conceptions of what is right and wrong, by applying a general rule, which is not correct, to practical cases. When it is received as a maxim that all virtue consists in seeking the happiness of the whole, and when a particular act seems to have that tendency, men are in danger of overlooking those moral distinctions by which our duty should be regulated. This effect has been observed in persons much given to theorise upon the general good as the end to be aimed at in all actions.

President Edwards has a treatise on Virtue, in which he enters very deeply into speculation on the principles of moral conduct. His definition of virtue has surprised all his admirers: it is, "the love of being as such." When, however, this strange definition comes to be explained, by himself and his followers, it amounts to the same as that which we have been considering, which makes all virtue to consist in disinterested benevolence.

Dr. Samuel Hopkins, who was his pupil, and well understood his principles, gives this as his definition of virtue, and has it as a radical principle of his whole system. It will not therefore be necessary to make any distinct remarks on President Edward's theory.

LESSONS IN ARITHMETIC.—No. XXXII.

PERIODICAL, OR CIRCULATING DECIMAL.

DECIMALS which consist of the *same figures or set of figures repeated, are called* PERIODICAL, OR CIRCULATING DECIMALS.

The repeating figures are called *periods*, or *repetends*. If one figure only repeats, it is called a *single period*, or *repetend*; as ·11111, etc.; ·33333, etc.

When the same set of figures recurs at equal intervals, it is called a *compound period*, or *repetend*; as ·01010101, etc.; ·123123123, etc.

If other figures arise before the period commences, the decimal is said to be a *mixed periodical*; all others are called *pure*, or *simple periodicals*. Thus ·42631631, etc., is a *mixed periodical*; and ·33333, etc., is a *pure periodical* decimal.

1. When a pure circulating decimal contains as many figures as there are units in the denominator less *one*, it is sometimes called a *perfect period*, or *repetend*. Thus, $\frac{1}{7} = ·142857$, etc., and is a perfect period.

2. The decimal figures which precede the period, are often called the *terminate* part of the fraction.

Circulating decimals are expressed by writing the period *once* with a *dot* over its first and last figure when compound; and when *single* by writing the repeating figure only once with a dot over it. Thus ·46135135, etc., is written $·46\dot{1}3\dot{5}$ and ·33, etc., $·\dot{3}$.

Similar periods are such as begin at the same place before or after the decimal point; as $·\dot{1}$ and $·\dot{3}$, or $2·3\dot{4}$ and $3·7\dot{6}$, etc.

Dissimilar periods are such as begin at different places; as $·1\dot{2}3$ and $·423\dot{5}$.

Similar and conterminous periods are such as begin and end in the same places; as $·2\dot{3}2\dot{1}$ and $16\dot{3}\dot{4}$.

REDUCTION OF CIRCULATING DECIMALS.

CASE I.—*To reduce pure circulating decimals to common fractions.*

To investigate this problem, let us recur to the origin of circulating decimals, or the manner of obtaining them. For example, $\frac{1}{9} = ·11111$, etc., or $·\dot{1}$; therefore the true value of $1·111\dot{1}$, etc., or $·\dot{1}$, must be $\frac{1}{9}$ from which it arose. For the same reason ·22222, etc., or $·\dot{2}$, must be twice as much or $\frac{2}{9}$; ·33333, etc., or $·\dot{3} = \frac{3}{9}$; $·\dot{4} = \frac{4}{9}$; $·\dot{5} = \frac{5}{9}$, etc.

Again, $\frac{1}{99} = ·010101$, etc., or $·\dot{0}\dot{1}$; consequently ·010101, etc., or $·\dot{0}\dot{1} = \frac{1}{99}$; ·020202, etc., or $·\dot{0}\dot{2} = \frac{2}{99}$; ·030303, etc., or $·\dot{0}\dot{3} = \frac{3}{99}$; ·070707, etc., or $·\dot{0}\dot{7} = \frac{7}{99}$, etc. So also $\frac{1}{999} = ·001001001$, etc., or $·00\dot{1}$; therefore ·001001, etc., or $·00\dot{1} = \frac{1}{999}$; $·00\dot{2} = \frac{2}{999}$; etc.

In like manner $\frac{1}{7} = ·\dot{1}42857\dot{}$; and $1\dot{4}2857\dot{} = \frac{142857}{999999}$; for, multiplying the numerator and denominator of $\frac{1}{7}$ by 142857, we have $\frac{142857}{999999}$. So $\frac{2}{7}$ is twice as much as $\frac{1}{7}$; $\frac{3}{7}$, three times as much, etc. Thus it will be seen that the value of a pure periodical decimal is expressed by the common fraction whose numerator is the given period, and whose denominator is as many 9s as there are figures in the period. Hence,

To reduce a pure circulating decimal to a common fraction.

Make the given period the numerator, and the denominator will be as many 9s as there are figures in the period.

Ex. 1. Reduce $·\dot{3}$ to a common fraction. *Ans.* $\frac{3}{9}$, or $\frac{1}{3}$.

2. Reduce $·\dot{6}$ to a common fraction. *Ans.* $\frac{6}{9}$, or $\frac{2}{3}$.

3. Reduce $·\dot{1}\dot{8}$ to a common fraction.

4. Reduce $·\dot{1}2\dot{3}$ to a common fraction.

5. Reduce $\cdot\dot{2}9\dot{7}$ to a common fraction.

6. Reduce $\cdot\dot{7}\dot{2}$ to a common fraction.

7. Reduce $\cdot\dot{0}\dot{9}$ to a common fraction.

8. Reduce $\cdot 04\dot{5}$ to a common fraction.

9. Reduce $\cdot\dot{1}42857\dot{1}$ to a common fraction.

10. Reduce $\cdot 0769\dot{2}3$ to a common fraction.

CASE II.— *To reduce mixed circulating decimals to common fractions.*

11. Reduce $\cdot 16$ to a common fraction.

Analysis.—Separating the mixed decimal into its terminate and periodical part, we have $\cdot 16 = \cdot 1 + \cdot 0\dot{6}$. Now $\cdot 1 = \frac{1}{10}$; and $\cdot 0\dot{6} = \frac{6}{90}$; for, the pure period $\cdot 6 = \frac{6}{9}$, and since the mixed period $\cdot 0\dot{6}$, begins in hundredths' place, its value is evidently only $\frac{1}{10}$ as much; but $\frac{6}{9} \div 10 = \frac{6}{90}$. Therefore $\cdot 16 = \frac{1}{10} + \frac{6}{90}$. Now $\frac{1}{10}$ and $\frac{6}{90}$, reduced to a common denominator and added together, make $\frac{15}{90}$, or $\frac{1}{6}$. *Ans.*

In mixed circulating decimals, if the period begins in *hundredths'* place, it is evident from the preceding analysis that the value of the periodical part is only $\frac{1}{10}$ as much as it would be if the period were pure or begun in *tenths'* place; when the period begins in *thousandths'* place, its value is only $\frac{1}{100}$ part as much, etc. Thus $\cdot\dot{6} = \frac{6}{9}$; $\cdot 0\dot{6} = \frac{6}{9} \div 10 = \frac{6}{90}$; $\cdot 00\dot{6} = \frac{6}{9} \div 100 = \frac{6}{900}$, etc.

Hence, the *denominator* of the *periodical* part of a mixed circulating decimal, is always as many 9s as there are figures in the *period* with as many *ciphers annexed* as there are decimals in the *terminate part.*

12. Reduce $\cdot 8567\dot{9}2\dot{3}$ to a common fraction.

Solution.—Reasoning as before $\cdot 8567\dot{9}2\dot{3} = \frac{8567}{10000} + \frac{923}{9999000}$. Reducing these two fractions to the least common denominator, $\frac{8567}{10000} \times \frac{9999}{9999} = \frac{85669233}{99990000}$ whose denominator is the same as that of the other. Now $\frac{85669233}{99990000} + \frac{923}{9999000} = \frac{85678563}{99990000}$. *Ans.*

Contraction.

8500000
85
8499915 1st Nu.
67923 2nd Nu.
8567838
9999900 *Ans.*

To multiply by 99999, annex as many ciphers to the multiplicand as there are 9s in the multiplier, etc. This gives the numerator of the first fraction or terminate part, to which add the numerator of the second or periodical part, and the sum will be the numerator of the answer. The denominator is the same as that of the second or periodical part.

Second Method.

8567923 the given circulating decimal.
85 the terminate part which is subtracted.
8567838 the numerator of the answer.
$\frac{8567838}{9999900}$ *Ans.*

Note.—1. The *reason* of this operation may be shewn thus: $8567923 = 8500000 + 67923$. Now $8500000 - 85 + 67923$ is equal to $8567923 - 85$,

2. It is evident that the required denominator is the same as that of the periodical part; for, the denominator of the periodical part is the least common multiple of the two denominators. Hence,

To reduce a mixed circulating decimal fraction.

Change both the terminate and periodical part to common fractions separately, and their sum will be the answer required.

Or, from the given mixed periodical, subtract the terminate part, and the remainder will be the numerator required. The denominator is always as many 9s *as there are figures in the period, with as many ciphers annexed as there are decimals in the terminate part.*

PROOF.—*Change the common fraction back to a decimal, and if the result is the same as the given circulating decimal, the work is right.*

13. Reduce $\cdot 13\dot{8}$ to a common fraction. *Ans.* $\frac{124}{888}$, or $\frac{31}{222}$

14. Reduce $\cdot 5\dot{3}$ to a common fraction.

15 Reduce $\cdot 59\dot{2}5\dot{2}$ to a common fraction.

16. Reduce $\cdot 583\dot{3}$ to a common fraction.

17. Reduce $\cdot 0\dot{2}2\dot{7}$ to a common fraction.

18. Reduce $\cdot 474\dot{5}$ to a common fraction.

19. Reduce $\cdot 59\dot{2}5\dot{2}$ to a common fraction.

20. Reduce $\cdot 008497133\dot{3}$ to a common fraction.

CASE III.—*Dissimilar periodicals reduced to similar and conterminous ones.*

In changing dissimilar periods, or repatends, to similar and conterminous ones, the following particulars require attention.

1. Any *terminate* decimal may be considered as *interminate* by annexing ciphers continually to the numerator. Thus $46 = \cdot 460000$, etc. $= \cdot 46\dot{0}$.

2. Any *pure* periodical may be considered as *mixed*, by taking the given period for the *terminate part*, and making the given period the interminate part. Thus $\cdot\dot{4}\dot{6} = \cdot 4\dot{6} + \cdot 00\dot{4}\dot{6}$, etc.

3. A *single* period may be regarded as a *compound* periodical. Thus $\cdot\dot{3}$ may become $\cdot\dot{3}\dot{3}$, or $\cdot\dot{3}\dot{3}\dot{3}$; so $\cdot\dot{6}\dot{3}$ may be made $\cdot 6\dot{3}\dot{3}\dot{3}$, or $\cdot 63\dot{3}\dot{3}\dot{3}$, etc.

4. A *single* period may also be made to begin at a lower order, regarding its higher orders as terminate decimals. Thus $\cdot\dot{3}$ may be made $\cdot 3\dot{3}$, or $\cdot 333\dot{3}$, etc.

5. *Compound* periods may also be made to begin at a lower order. Thus $\cdot 3\dot{6}$ may be changed to $\cdot 3\dot{6}\dot{3}$, or $\cdot 36\dot{3}\dot{6}\dot{3}$, etc.; or by extending the number of places $\cdot 4\dot{7}\dot{9}$ may be made $\cdot 47\dot{9}\dot{7}\dot{9}$, or $4\dot{7}9\dot{7}\dot{9}$, etc.; or making both changes at once $\cdot 5\dot{3}\dot{2}$ may be changed to $\cdot 5325325$, etc. Hence,

To make any number of dissimilar periodical decimals similar.

Move the points, so that each period shall begin at the same order as the period which has the most figures in its terminate part.

21. Change $6\cdot 8\dot{1}\dot{4}$, $3\cdot 2\dot{6}$, and $\cdot 0\dot{8}\dot{3}$ to similar and conterminous periods.

Operation.

$6\cdot 8\dot{1}\dot{4} = 6\cdot 81481481\dot{4}$
$3\cdot 2\dot{6} = 3\cdot 26262626$
$\cdot 0\dot{8}\dot{3} = 0\ 08333333$

Having made the given periods similar, the next step is to make them conterminous. Now as one of the given periods contains 3 figures, another 2, and the other 1, it is evident the new periodical must contain a number of figures which is some multiple of the *number* of figures in the different periods; viz: 3, 2, and 1. But the least common multiple of 3, 2, and 1 is 6; therefore the new periods must at least contain 6 figures. Hence,

To make any number of *dissimilar* periodical decimals *similar* and *conterminous.*

First make the periods similar; then extend the figures of each to as many places as there are units in the least common multiple of the NUMBER *of periodical figures contained in each of the given decimals.*

22. Change $46\ 1\dot{6}\dot{2}$, $5\cdot 2\dot{6}$, $73\cdot 4\dot{2}\dot{3}$, $\cdot 48\dot{6}$, and $12\ 5$, to similar and conterminous periodicals.

Operation.

$46\ 1\dot{6}\dot{2} = 46\cdot 1021621\dot{6}$
$5\cdot 2\dot{6} = 5\cdot 26262626$
$63\cdot 4\dot{2}\dot{3} = 63\ 42342342$
$\cdot 48\dot{6} = 0\cdot 486666665$
$12\cdot 5 = 12\cdot 50000000$

The numbers of periodical figures in the given decimals are 3, 2, 3, and 1; and the least common multiple of them is 6. Therefore the new periods must each have 6 figures.

23. Make $\cdot 2\dot{7}$, $\cdot\dot{3}$, and $\cdot 04\dot{5}$ similar and conterminous.

24. Make $4\cdot 3\dot{2}1$, $6\cdot 4\dot{2}6\dot{3}$, and $\cdot 6$ similar and conterminous.

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ADDITION OF CIRCULATING DECIMALS.

Ex. 1. What is the sum of $17\cdot\dot{2}\dot{3} + 41\cdot\dot{2}\dot{4}\dot{7}\dot{6} + 8\cdot\dot{6}\dot{1} + 1\cdot5 + 35\cdot\dot{4}\dot{2}\dot{3}$?

Operation.

Dissimilar. Sim. & Conterminous.

$17\cdot\dot{2}\dot{3} = 17\cdot2323232\dot{3}$
$41\cdot\dot{2}\dot{4}\dot{7}\dot{6} = 41\cdot2476\dot{4}\dot{7}\dot{6}$
$8\cdot\dot{6}\dot{1} = 8\cdot6161616\dot{1}$
$1\cdot5 = 1\cdot5000000\dot{0}$
$35\cdot\dot{4}\dot{2}\dot{3} = 35\cdot4232323\dot{4}$
Ans. $104\cdot0193646\dot{4}$

First make the given decimals similar and conterminous. Then add the periodical parts as in simple addition, and since there are six figures in the period, divide their sum by 999999; for this would be its denominator, if the sum of the periodicals were expressed by a common fraction. Setting down the remainder for the repeating decimals, carry the quotient 1 to the next column, and proceed as in addition to whole numbers. Hence,

We derive the following general

RULE FOR ADDING CIRCULATING DECIMALS.

First make the periods similar and conterminous, and find their sum as in Simple Addition. Divide this sum by as many 9s as there are figures in the period, set the remainder under the figures added for the period of the sum, carry the quotient to the next column, and proceed with the rest as in Simple Addition.

If the remainder has not so many figures as the period, ciphers must be prefixed to make up the deficiency.

Another method of adding circulating decimals is, to reduce each to its equivalent vulgar fraction, and then add, reducing the result to a circulating decimal, if required.

2. What is the sum of $24\cdot1\dot{3}\dot{2} + 2\cdot\dot{2}\dot{3} + 85\cdot\dot{2}\dot{4} + 67\cdot\dot{6}$?
3. What is the sum of $328\cdot12\dot{6} + 81\cdot\dot{2}\dot{3} + 5\cdot6\dot{2}\dot{4} + 61\cdot\dot{6}$?
4. What is the sum of $31\cdot\dot{6}\dot{2} + 7\cdot6\dot{2}\dot{4} + 6\cdot3\dot{9}\dot{2} + \cdot0\dot{2}\dot{7}$?
5. What is the sum of $462\cdot\dot{3}\dot{4} + 60\cdot\dot{8}\dot{2} + 71\cdot1\dot{6}\dot{4} + \cdot\dot{3}\dot{5}$?
6. What is the sum of $60\cdot25 + \cdot\dot{3}\dot{4} + 6\cdot43\dot{5} + \cdot45 + 45\cdot\dot{2}\dot{4}$?
7. What is the sum of $9\cdot8\dot{1}\dot{4} + 1\cdot5 + 87\cdot\dot{2}\dot{6} + 0\cdot\dot{8}\dot{3} + 124\cdot0\dot{9}$?
8. What is the sum of $3\cdot\dot{6} + 78\cdot3\dot{1}\dot{7}\dot{6} + 735\cdot\dot{3} + 375 + 27\cdot\dot{7} + 187\cdot\dot{4}$?
9. What is the sum of $5391\cdot35\dot{7} + 72\cdot\dot{3}\dot{6} + 187\cdot\dot{2}\dot{1} + 4\cdot29\dot{6}\dot{3} + 217\cdot8496\dot{4} + 42\cdot176\dot{4} + \cdot523 + 58\cdot30046\dot{4}$?
10. What is the sum of $\cdot1\dot{6}\dot{2} + 134\cdot0\dot{9} + 2\cdot\dot{9}\dot{3} + 97\cdot\dot{2}\dot{6} + 3\cdot\dot{7}09230\dot{4} + 99\,083 + 1\cdot\dot{6} + \cdot\dot{6}\dot{1}\dot{4}$?

SUBTRACTION OF CIRCULATING DECIMALS.

Ex. 1. From $52\cdot\dot{8}\dot{6}$ take $8.37235\dot{4}$.

Operation.

$52\cdot\dot{8}\dot{6} = 52.868\dot{6}\dot{8}$
$8\cdot37235\dot{4} = 8\cdot37235\dot{4}$
$44\cdot49633\dot{4}$

We first make the given decimals similar and conterminous, then subtract as in whole numbers. But since the period in the lower line is larger than that above it, we must borrow 1 from the next higher order. This will make the right hand figure of the remainder one less than if it was a terminate Decimal. Hence,

We derive the following general

RULE FOR SUBTRACTING CIRCULATING DECIMALS.

Make the periods similar and conterminous, and subtract as in whole numbers. If the period in the lower line is larger than that above it, diminish the right hand figure of the remainder by 1.

The *reason* for diminishing the right hand figure of the remainder by 1, if the period in the lower line is larger than that above it, may be explained thus:

When the period in the lower line is larger than that above it, we must evidently borrow 1 from the next higher order. Now if the given decimals were extended to a second period, in this period the lower number would also be larger than that above it, and therefore we must borrow 1. But having borrowed one in the second period, we must also carry one to the next figure in the lower line, or, what is the same in effect, diminish the right hand figure of the remainder by 1.

Another method of subtracting circulating decimals is, to reduce each to its equivalent vulgar fraction, and then subtract, reducing the result to a circulating decimal, if required.

2. From $85\cdot\dot{6}\dot{2}$ take $13\cdot7\dot{6}13\dot{2}$. *Ans.* $71\cdot\dot{8}3\dot{1}9\dot{3}$.
3. From $476\,32\dot{4}$ take $84\,709\dot{7}$.
4. From $3\cdot8564$ take $\cdot0382$.
5. From $46\cdot1\dot{2}\dot{3}$ take $41\cdot\dot{3}$.
6. From $801\cdot\dot{6}$ take $400\cdot7\dot{5}$.
7. From $4\cdot78\dot{2}\dot{4}$ take $\cdot8\dot{7}$.
8. From $1419\cdot6$ take $1200\,\dot{9}$.
9. From $\cdot634852$ take $\cdot0\dot{2}1\dot{4}$.
10. From $8482\cdot42\dot{1}$ take $6031\cdot0\dot{3}5$.

MULTIPLICATION OF CIRCULATING DECIMALS.

Ex. 1. What is the product of $\cdot\dot{3}\dot{6}$ into $\cdot2\dot{5}$?

Operation.

$\cdot\dot{3}\dot{6} = \frac{36}{99} = \frac{4}{11}$
$\cdot25 = \frac{25}{100} + \frac{25}{9900} = \frac{11}{44}$.
Now $\frac{4}{11} \times \frac{11}{44} = \frac{44}{484}$
But $\frac{44}{484} = \cdot092$ *Ans.*

We first reduce the given periodicals to common fractions; then multiply them together. Finally, we reduce the product to a periodical decimal. Hence,

We derive the following general

RULE FOR MULTIPLYING CIRCULATING DECIMALS.

First reduce the given periodicals to common fractions, and multiply them together as usual. Finally, reduce the product to decimals and it will be the answer required.

If the numerators and denominators have *common* factors, the operation may be *contracted* by *cancelling* those factors before the multiplication is performed.

2. What is the product of $37\cdot2\dot{3}$ into $\cdot2\dot{0}$? *Ans.* $9\,928\dot{5}$.
3. What is the product of $\cdot12\dot{3}$ into $\cdot\dot{6}$?
4. What is the product of $\cdot2\dot{4}\dot{5}$ into $7\cdot\dot{3}$?
5. What is the product of $24\,\dot{6}$ into $15\cdot\dot{7}$?
6. What is the product of $48\cdot2\dot{3}$ into $16\cdot1\dot{3}$?
7. What is the product of $8574\cdot\dot{3}$ into $87\cdot\dot{6}$?
8. What is the product of $3\cdot9\dot{7}\dot{3}$ into $\cdot8$?
9. What is the product of $49640\cdot64$ into $\cdot70603$?
10. What is the product of $7\,\dot{7}\dot{2}$ into $\cdot29\dot{7}$?

DIVISION OF CIRCULATING DECIMALS.

Ex. 1. Divide $234\cdot\dot{6}$ by $\dot{7}$.

Operation.

$234\cdot\dot{6} = 234\frac{2}{3} = \frac{704}{3}$
$\cdot\dot{7} = \frac{7}{9}$
Now $\frac{704}{3} \div \frac{7}{9} = \frac{704}{3} \times \frac{9}{7} = \frac{6336}{21}$
And $\frac{6336}{21} = 301\cdot\dot{7}14285$ *Ans.*

We first reduce the divisor and dividend to common fractions, and divide one by the other; then reduce the quotient to a decimal.

Hence, we derive the following general

RULE FOR DIVIDING CIRCULATING DECIMALS.

Reduce the divisor and dividend to common fractions; divide one fraction by the other, and reduce the quotient to decimals.

After the divisor is inverted, if the numerators and denominators have factors common to both, the operation may be *contracted* by *cancelling* those factors.

2. Divide $319\cdot2800\dot{7}1\dot{2}$ by $764\cdot5$. *Ans.* $0\cdot4170326$.
3. Divide $16\cdot\dot{5}\dot{6}$ by $\cdot\dot{3}$.
4. Divide $\cdot\dot{6}$ by $\cdot12\dot{3}$.

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5. Divide $2{\cdot}\dot{2}9\dot{7}$ by $\cdot\dot{2}9\dot{7}$.
6. Divide $750730{\cdot}5\dot{1}\dot{6}$ by $87{\cdot}5$.
7. Divide $\dot{6}\dot{4}$ by $\cdot 1\dot{6}$.
8. Divide $13{\cdot}5\dot{1}6\dot{9}53\dot{3}$ by $4{\cdot}\dot{2}9\dot{7}$.
9. Divide $21{\cdot}08\dot{1}$ by $\cdot 3\dot{6}\dot{6}$.
10. Divide $\cdot\dot{3}\dot{6}$ by $\cdot 2\dot{5}$.

LESSONS IN ALGEBRA.—No. XXIV.

(*Continued from page 46.*)

REDUCTION OF EQUATIONS BY INVOLUTION.

In an equation, the letter which expresses the unknown quantity is sometimes found under a *radical sign*. We may have $\sqrt{x} = a$.

To clear this of the radical sign, let each member of the equation be squared, that is, multiplied into itself. We shall then have $\sqrt{x} \times \sqrt{x} = aa$. Or, $x = a^2$.

The equality of the sides is not affected by this operation, because each is only multiplied into itself, that is, equal quantities are multiplied into equal quantities.

The same principle is applicable to any root whatever. If $\sqrt[n]{x} = a$; then $x = a^n$. For a root is raised to a power of the same name, by removing the index or radical sign. Hence,

To reduce an equation when the unknown quantity is under a radical sign.

Involve both sides to a power of the same name, as the root expressed by the radical sign.

N.B. It will generally be expedient to make the necessary transpositions, and to clear the equation of fractions, *before* involving the quantities; so that all those which are not under the radical sign may stand on one side of the equation.

1. Reduce the equation $\sqrt{x} + 4 = 9$
 Transposing $+4$ $\sqrt{x} = 9 - 4 = 5$
 Involving both sides, $x = 5^2 = 25$. Ans.
2. Reduce the equation $a + \sqrt[n]{x - b} = d$
 By transposition $\sqrt[n]{x} = d + b - a$
 By involution $x = (d + b - a)^n$. Ans.
3. Reduce the equation $\sqrt[3]{x + 1} = 4$.
4. Reduce the equation $4 + 3\sqrt{x - 4} = 6 + \frac{1}{2}$.
5. Reduce the equation $\sqrt{a^2 + \sqrt{x}} = \frac{3 + d}{\sqrt{(a^2 + \sqrt{x})}}$.
6. Reduce $3 + 2\sqrt{x - 1} = 6$.
7. Reduce $4\sqrt{\frac{x}{5}} = 8$.
8. Reduce $(2x + 3)^{\frac{1}{2}} + 4 = 7$.
9. Reduce $\sqrt{12 + x} = 2 + \sqrt{x}$.
10. Reduce $\sqrt{x - a} = \sqrt{x} - \frac{1}{2}\sqrt{a}$.
11. Reduce $\sqrt{5} \times \sqrt{x + 2} = 2 + \sqrt{5x}$.
12. Reduce $\frac{x - ax}{\sqrt{x}} = \frac{\sqrt{x}}{x}$.
13. Reduce $\frac{\sqrt{x} + 28}{\sqrt{x} + 4} = \frac{\sqrt{x} + 38}{\sqrt{x} + 6}$.
14. Reduce $\sqrt{x} + \sqrt{a + x} = \frac{2a}{\sqrt{(a + x)}}$.
15. Reduce $x + \sqrt{a^2 + x^2} = \frac{2a^2}{\sqrt{(a^2 + x^2)}}$.
16. Reduce $x + a = \sqrt{a^2 + x\sqrt{(b^2 + x^2)}}$.
17. Reduce $\sqrt{2 + x} + \sqrt{x} = \frac{4}{\sqrt{(2 + x)}}$.
18. Reduce $\sqrt{x - 32} = 16 - \sqrt{x}$.
19. Reduce $\sqrt{4x + 17} = 2\sqrt{x} + 1$.
20. Reduce $\frac{\sqrt{(6x)} - 2}{\sqrt{(6x)} + 2} = \frac{4\sqrt{(6x)} - 9}{4\sqrt{(6x)} + 6}$.

REDUCTION OF EQUATIONS BY EVOLUTION.

In many equations the letter which expresses the unknown quantity is involved to some power. Thus,

In the equation $x^2 = 16$,

We have the value of the *square* of x, but not of x itself.

If the square root of both sides be extracted,

We shall have $x = 4$.

The equality of the members is not affected by this reduction. For if two quantities or sets of quantities are equal, their roots are also equal.

If $(x + a)^n = b + h$, then $x + a = \sqrt[n]{b + h}$. Hence,

To reduce an equation when the unknown quantity is a power.

Extract the root of both sides which corresponds with the power expressed by the index of the unknown quantity.

1. Reduce the equation $6 + x^2 - 8 = 7$
 By transposition, $x^2 = 7 + 8 - 6 = 9$
 By evolution $x = \pm\sqrt{9} = \pm 3$. Ans.

The signs $+$ and $-$ are both placed before $\sqrt{9}$, because an even root of an affirmative quantity is *ambiguous*.

2. Reduce the equation $5x^2 - 30 = x^2 + 34$
 Transposing, etc., $x^2 = 16$
 By evolution, $x = \pm 4$. Ans.
3. Reduce the equation $a + \frac{x^2}{b} = h - \frac{x^2}{d}$.
4. Reduce the equation $a + dx^n = 10 - x^n$.

From the preceding articles it will be easy to see, that to reduce an equation containing a root of a power, requires both *involution* and *evolution*.

5. Reduce the equation $\sqrt[3]{x^2} = 4$
 By involution, $x^2 = 4^3 = 64$
 By evolution, $x = \pm\sqrt{64} = \pm 8$. Ans.
6. Reduce the equation $\sqrt{x^n - a} = b - d$.
7. Reduce the equation $(x + a)^{\frac{1}{2}} = \frac{a + b}{(x - a)^{\frac{1}{2}}}$.
8. Reduce the equation $(x^2 - 1)^{\frac{1}{2}} = \frac{8}{(x^2 - 1)^{\frac{1}{2}}}$.
9. Reduce the equation $\sqrt{x^2 - 11} = 5$.
10. Reduce the equation $\sqrt{y^2 - 4ab} = a - b$.
11. Reduce the equation $(13 + \sqrt{23 + y^2})^{\frac{1}{2}} = 5$.
12. Reduce the equation $(3 + \sqrt[3]{329 + x^2})^2 = 144$.

PROBLEMS.

Prob. 1. A gentleman being asked his age, replied, "If you add to it 10 years, and extract the square root of the sum, and from this root subtract 2, the remainder will be 6." What was his age?

By the conditions of the problem, $\sqrt{x + 10} - 2 = 6$
By transposition, $\sqrt{x + 10} = 6 + 2 = 8$
By involution, $x + 10 = 8^2 = 64$
And $x = 64 - 10 = 54$.

Proof. $\sqrt{54 + 10} - 2 = 6$.

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Proh. 2. If to a certain number 22577 be added, and the square root of the sum he extracted, and from this 163 be subtracted, the remainder will be 237. What is the number?

Let x = the number sought, $b = 163$

$a = 22577$, $c = 237$

By the conditions proposed, $\sqrt{x+a} - b = c$

By transposition, $\sqrt{x+a} = c+b$

By involution, $x+a = (c+b)^2$

And $x = (c+b)^2 - a$

Restoring the numbers, $x = (237+163)^2 - 22577$

That is $x = 160000 - 22577 = 137423.$

Proof. $\sqrt{137423 + 22577} - 163 = 237.$

When an equation is reduced by extracting an even root of a quantity, the solution does not always determine whether the answer is positive or negative. But what is thus left ambiguous by the algebraic process, is frequently settled by the statement of the problem.

Prob. 3. A merchant gains in trade a sum to which 320 pounds bears the same proportion as five times this sum does to 2500. What is the amount gained?

Prob. 4. The distance to a certain place is such, that if 96 be subtracted from the square of the number of miles, the remainder will be 48. What is the distance?

Prob. 5. If three times the square of a certain number be divided by 4, and if the quotient be diminished by 12, the remainder will be 180. What is the number?

Prob. 6. What number is that, the fourth part of whose square being subtracted from 8, leaves a remainder equal to 4?

Prob. 7. What two numbers are these, whose sum is to the greater as 10 to 7; and whose sum multiplied into the less produces 270?

Prob. 8. What two numbers are those, whose difference is to the greater as 2 to 9, and the difference of whose squares is 126?

Prob. 9. It is required to divide the number 18 into two such parts, that the squares of those parts may be to each other as 25 to 16.

Prob. 10. It is required to divide the number 14 into two such parts that the quotient of the greater divided by the less, may be to the quotient of the less divided by the greater as 16 to 9.

Prob. 11. What two numbers are as 5 to 4, the sum of whose cubes is 5103.

Prob. 12. Two travellers, A and B, set out to meet each other, A leaving the town C at the same time that B left D. They travelled the direct road between C and D; and on meeting, it appeared that A had travelled 18 miles more than B, and that A could have gone B's distance in 15¾ days, but B would have been 28 days in going A's distance. Required the distance between C and D.

Prob. 13. Find two numbers which are to each other as 6 to 5, and whose product is 360.

Prob. 14. A gentleman bought two pieces of silk, which together measured 36 yards. Each of them cost as many shillings per yard as there were yards in the piece, and their whole prices were as 4 to 1. What were the lengths of the pieces?

Prob. 15. Find two numbers which are to each other as 3 to 2; and the difference of whose fourth powers is to the sum of their cubes as 26 to 7.

Prob. 16. Several gentlemen made an excursion, each taking the same sum of money. Each had as many servants attending him as there were gentlemen; the number of crowns which each had was double the number of all the servants, and the whole sum of money taken out was 5456 crowns. How many gentlemen were there?

Prob. 17. A detachment of soldiers from a regiment being ordered to march on a particular service, each company furnished four times as many men as there were companies in the whole regiment; but these being found insufficient, each company furnished three men more; when their number was found to be increased in the ratio of 17 to 16. How many companies were there in the regiment?

ADFECTED QUADRATIC EQUATIONS

Equations are divided into classes, which are distinguished from each other by the power of the letter that expresses the unknown quantity. Those which contain only the *first* power of the unknown quantity are called *simple* equations, or equations of the first degree. Those in which the highest power of the unknown quantity is a *square*, are called *quadratic*, or equations of the *second degree*; those in which the highest power is a *cube*, are called *cubic*, or equations of the *third degree*, etc.

Thus $x = a + b$, is an equation of the *first* degree.

$x^2 = c$, and $x^2 + ax = d$,

are *quadratic* equations, or equations of the *second* degree.

$x^3 = h$, and $x^3 + ax^2 + bx = d$,

are *cubic* equations, or equations of the *third* degree.

Equations are also divided into *pure* and *adfected* equations. A pure equation contains only *one power* of the unknown quantity. This may be the first, second, third, or any other power. An adfected equation contains *different powers* of the unknown quantity. Thus,

$\left\{\begin{array}{l} x^2 = d - b, \text{ is a pure quadratic equation.} \\ x^2 + bx = d, \text{ an adfected quadratic equation.} \end{array}\right.$

$\left\{\begin{array}{l} x^3 = b - c, \text{ a pure cubic equation.} \\ x^3 + ax^2 + bx = h, \text{ an adfected cubic equation.} \end{array}\right.$

In a *pure* equation, all the terms which contain the unknown quantity may be united in one, and the equation, however complicated in other respects, may be reduced by the rules which have already been given. But in an *adfected* equation, as the unknown quantity is raised to *different powers*, the terms containing these powers cannot be united.

An adfected quadratic equation is one which contains the unknown quantity in one term, and the square of that quantity in another term.

The unknown quantity may be originally in *several* terms of the equation. But all these can be reduced to two, one containing the unknown quantity, and the other its square.

It has already been shown that a *pure* quadratic is solved by *extracting the root of both sides of the equation*. An *adfected* quadratic may be solved in the same way, if the member which contains the unknown quantity is an *exact square*.

Thus the equation $x^2 + 2ax + a^2 = b + h$, may be reduced by evolution. For the first member is the *square* of a *binomial* quantity. And its root is $x + a$. Therefore,

$x + a = \sqrt{b+h}$, and by transposing a,

$x = \sqrt{b+h} - a.$

But it is not often the case, that the member of an adfected quadratic containing the unknown quantity, is an *exact square*, till an additional term is applied, for the purpose of making the required reduction.

In the equation $x^2 + 2ax = b$, the side containing the unknown quantity is not a complete square. The two terms of which it is composed are indeed such as might belong to the square of a binomial quantity. But one term is *wanting*. We have then to inquire, in what way this may be supplied. From having *two* terms of the square of a binomial given, how shall we find the *third*?

Of the three terms, two are complete powers, and the other is twice the product of the roots of these powers, or, which is the same thing, the product of one of the roots into twice the other.

In the expression $x^2 + 2ax$, the term $2ax$ consists of the factors $2a$ and x. The latter is the unknown quantity. The other factor $2a$ may be considered the *co-efficient* of the unknown quantity; a co-efficient being another name for a factor. As x is the root of the first term x^2, the other factor $2a$ is *twice* the root of the third term, which is wanted to complete the square. Therefore *half* of $2a$ is the root of the deficient term, and a^2 is the term itself.

The square completed is $x^2 + 2ax + a^2$, where it will be seen that the last term a^2 is the square of half of $2a$, and $2a$ is the co-efficient of x, the root of the first term.

In the same manner it may be proved that the last term of the square of any binomial quantity is equal to the square of half the co-efficient of the root of the first term.

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From this principle is derived the following

METHOD FOR COMPLETING THE SQUARE.

Take the square of half the co-efficient of the first power of the unknown quantity, and add it to both sides of the equation.

It will be observed that there is nothing *peculiar* in the solution of *affected quadratics*, except the *completing of the square*. *Quadratic* equations are *formed* in the same manner as *simple* equations; and after the square is completed, they are reduced in the same manner as pure equations.

1. Reduce the equation $x^2+6ax=b$

Completing the square, $x^2+6ax+9a^2=9a^2+b$

Extracting the root of both sides, $x+3a=\pm\sqrt{9a^2+b}$

And $x=-3a\pm\sqrt{9a^2+b}$. Ans.

Here the co-efficient of x, in the given equation, is $6a$. The square of half this is $9a^2$, which being added to both sides completes the square. The equation is then reduced by extracting the root of each member.

2. Reduce the equation $x^2-8bx=h$.

3. Reduce the equation $x^2+ax=b+h$.

Completing the square, $x^2+ax+\frac{a^2}{4}=\frac{a^2}{4}+b+h$.

4. Reduce the equation $x^2-x=h-d$.

5. Reduce the equation $x^2+3x=d+6$.

6. Reduce the equation $x^2-abx=ab-cd$.

7. Reduce the equation $x^2+\frac{ax}{b}=h$.

8. Reduce the equation $x^2-\frac{x}{b}=7h$.

In these, and similar instances, the root of the third term of the completed square is easily found, because this root is the same half co-efficient from which the term has just been derived. Thus, in the last example, half the co-efficient of x is $\frac{1}{2b}$, and this is the root of the third term $\frac{1}{4b^2}$.

When the first power of the unknown quantity is in *several terms*, these should be united in one, if this can be done by the rules for reduction in addition. But if there are *literal* co-efficients, these may be considered as constituting, together, a *compound* co-efficient or factor, into which the unknown quantity is multiplied.

Thus, $ax+bx+dx=(a+b+d)\times x$. The square of half this compound co-efficient is to be added to both sides of the equation.

9. Reduce the equation $x^2+3x+2x+x=d$

Uniting terms $x^2+6x=d$

Completing the square $x^2+6x+9=9+d$

And $x=-3\pm\sqrt{9+d}$. Ans.

10. Reduce the equation $x^2+ax+bx=h$

$x^2+(a+b)\times x=h$

Therefore $x^2+(a+b)\times x+\left(\frac{a+b}{2}\right)^2=\left(\frac{a+b}{2}\right)^2+h$.

11. Reduce the equation $x^2+ax-x=b$.

LESSONS IN GREEK.—No. LIII.

By JOHN R. BEARN, D.D.

Moods.

THE moods represent the circumstances under which the subject is united with the verb, or the manner in which the affirmation of the verb is made. In simple propositions the indicative, the subjunctive, and the optative moods are employed; the imperative is a form by itself, since the imperative does not make a simple statement.

The indicative denotes that in consequence of an apprehension of the mind, whether the object apprehended be material or intellectual, the subject is simply applied to the verb, and therefore serves to express historical events and absolute facts; its office being merely to indicate or declare a reality. In Greek the use of the indicative generally resembles its use in other languages. Some peculiarities, however, have to be set forth.

The indicative, in union with the particle ἀν (κε, κεν), presents a condition whose realisation depends on circumstances, to which reference is made by the conjunction. This form of speech occurs partly in the historical tenses and partly in the future.

The indicative of the historical tenses in connection with ἀν, denotes that a condition takes place as often as the requisite circumstances occur, consequently neither always nor merely once, *e.g.*

Ὅτι μαθοιμ' ἑκαστοτε, ἐπελανθανομην ἀν εὐθυς

Whatever on each occasion I learned, forthwith I commonly forgot it.

The force of the idiom may be illustrated by the use of our conditional *would*, denoting repetition under certain alleged circumstances:

These things
Would Desdemona seriously incline.
But still the house affairs *would* draw her thence;
Which ever as she *could* with haste despatch,
She'd come again, and with a greedy ear
Devour up my discourse.

The indicative with ἀν also signifies that a condition has not taken place or cannot take place, since the requisite circumstances do not exist; *e.g.*

Τίς ἀν φηθη ταυτα γενισθαι;

Who could believe that these things happened?

This usage may be represented by these English forms—*would or could ... if; would or could have ... but for*, indicating that as the conditional circumstances did not (or do not) exist, so the contingency did not take place.

Frequently are these forms used—εἰδες ὀν, *you would have seen*; ηγησω ἀν, *you would have thought*; ἐγνω ἀν τις, *one would observe*.

Sometimes for the expression of this sense you find the indicative without ἀν, when the condition which, under certain circumstances, would have taken place, is represented as actually taking place. In most verbs this mode of expression is admissible only when a subordinate hypothetical sentence is subjoined to the principal sentence; *e.g.*

Ἠισχυνομην μεντοι, ει ὑπο πολεμιου ἐξηπατηθην

I should be ashamed indeed, if I were deceived by an enemy.

In a somewhat similar manner we use the indicative *had*; *e.g.*

He had gone, if the ship had arrived in time.

With the ideas of duty, will, and power, this use of the indicative is common, without the hypothetical clause; as

Μενειν ἐχρην τον κατηγοροῦντα τῶν ἀλλων

The accuser of others ought to remain.

So wishes, which are not fulfilled or cannot be fulfilled, take the indicative without ἀν; *e.g.*

Ὠφελε Κυρος ζῆν

Would Cyrus were alive.

The general import of this idiom is the exclusion of fact.

The indicative of the future in union with ἀν (in the poets κε, κεν), signifies that a future event is not absolutely certain, yet is in a high degree probable, and this construction is more frequently found in Homer; *e.g.*

Ἐγω δε κε τοι δωσω

I will give it thee, if I can.

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Suppositions are sometimes uttered as facts. This is done by the employment, in the indicative, of an independent sentence instead of a foregoing hypothetical one. This form of speech is used partly when a supposition is put in a general and unconditional manner; partly when the speaker intends to take to himself an unfounded statement of another; for which we employ the preparatory words, *suppose that, granted that*; *e.g.*

Αδικει τις ικων· οργη και τιμωρια κατ' αυτου
Some one advisedly does wrong; there are anger and punishment for him.

Ποσω ὑμας ἡκειν εις Φασιν· και δη και αποβαινομεν
You went to Phasis; well! we landed.

The indicative is also used by the Greeks in questions which express surprise, and which are intended to show that a condition of things assumed by another has no real existence; *e.g.*

Σωκρατης πιστευων θεους πως ουκ ειναι θεους ενομιζεν;
As Socrates believed in the gods, how did (could) he deny their existence?

The subjunctive and the optative moods denote that the predicate is applied to the subject according to a conception; consequently the relation here is one of dependence, the dependence may exist exclusively in the mind, or it may exist in the mind as represented by a word, that is, a verb or a conjunction. The subjunctive and the optative are in their essence very much alike, differing merely in regard to time; for the subjunctive sets forth the conception as at present lying in the mind of the speaker; the optative places that conception in the past. Thus, the subjunctive present in Greek corresponds with the subjunctive present in Latin, while the optative in Greek corresponds with the imperfect subjunctive in Latin.

In simple sentences the use of the subjunctive is very limited, and extends only to these instances:—

1. Homer, and the Epic poets in general, put positive as well as negative propositions sometimes in the subjunctive. By this mode of expression it is intimated that the speaker has not a certain but only a doubtful idea of the matter in question; and consequently the form serves to set forth an opinion, or an undecided notion; *e.g.*

Και ποτε τις ειπῃσιν
And once, I suppose, some one said.

2. Instead of an imperative the Greeks often employed an undecided statement, employing the subjunctive for the purpose. This mode of utterance is regularly employed when you address a request to yourself, either exclusively or in common with others, for the imperative is without the first person, and in that person is represented by the subjunctive. But also in the second and third persons the use of the subjunctive is not rare, especially in negative requests, and in union with the interjectional imperative *αγε, φερε, ἰθι*, come! *e.g.*

Φειδωμεθ' ανδρων ευγενων, κακους δ' αποπτυωμεν
Let us spare the well-born, and despise the base.

The occurrence in a simple sentence of the subjunctive with *ου μη* and *μη ου* is only apparently irregular, since the expressions are elliptical, something being understood; so that in the full exhibition of the proposition, the subjunctive would appear as a subordinate sentence. The words *φοβος εστι, there is a fear*; *δεος εστι, it is a duty*; are to be supplied with *ου μη*; *e. g.*

Elliptically, *ου μη σε απολιπω*
In full, *ου φοβος εστι μη σε απολιπω*
There is no fear that I should leave thee.

In this way certainty is intimated, and a positive assurance given; thus the example may be rendered—

By no means will I leave thee; or,
Thou hast no need to fear I will leave thee;

where the statement is exemplified, that the subjunctive depends on a state of mind. The subjunctive is the mood of conception or idea, as the indicative is the mood of fact; as the latter implies independence, so the former implies dependence.

In sentences with *μη ου* you are to understand or supply before the *μη*, *ὁρα, see*, or *σκοπει, consider*. In this way you as good as say, "You must take care that this or that does not take place." The phrase, therefore, serves to express an undecided or doubtful denial.

Αλλα μη ουκ ἡ διδακτον αρετη
But virtue can scarcely be taught.
Μη ου τουτ' γ' αλεπον, θανατον εκφυγειν
To avoid death may not be difficult.

That is, *σκοπει μη ου χαλεπαι*, etc., consider whether it is not easy to avoid death.

The optative, which represents a conception as lying to the speaker beyond the present, finds its proper application in the expression of a wish. Of the use of the optative in simple propositions there are two different forms, namely, the optative in and by itself (without *αν*), the simple optative; and the optative with *αν*. The optative without *αν* represents the expression as the free act of the mind, and without any reference to the province of reality. The optative with *αν* stands in a sentence subordinate to another, which is hypothetical, and which arises from the nature of the case; consequently the conception appears to ensue from certain prevailing circumstances. But the conception assumes the form of an eventual reality, since, if the required circumstances occurred, then the consequent result would take place. Instances of these usages are the following:—

1. When to a proposition which in narrative sets forth an opinion or statement, the determining cause thereof is subjoined in narrative, the optative is used without *αν*; as,

Απεκριναντο αυτῳ, ὁτι αδυνατα σφισιν ειη ποιειν ἁ
They answered him that it was impossible for them to do what
προκαλοιτο αντιν Αθηναιων· παιδες γαρ και γυναικες
he asks for, without the Athenians; for the children and women
παρ' εκεινοις εἰησαν.
were in their hands.

2. Hesitating views and determinations, if they intimate only an inclination in the mind of the speaker, are expressed by the optative without *αν*; if, however, it is intended to intimate that those views and determinations may, on a certain event's taking place, prove realities, then the optative with *αν* is employed:

Hesitation; opt. without αν: *Ρᾳδια θεος γ' ἐθελων και τηλοθεν ανδρα σωσαι.*
Easily, I think, can a god, if willing, even at a distance save a man.

Hesitation; opt. with αν: *Ουκ αν εγω ταυτα φησαιμι.*
I could not, I think, affirm these things.

In the refined tone of Attic conversation the optative with *αν* was a polite form of expression, by which convictions and determinations were set forth in a hesitating or qualified manner, and by which the harshness of direct requests was softened down; *e. g.*

Ὡρα αν ειη πραττειν τα δεοντα
This is the time, I would submit, to do one's duty.
Λεγοις αν ἁ δει λεγειν
Be so good as to say what ought to be said.

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The optative without *αν* may denote repetition; *e. g.*

Ει τις Σωκρατει περι του αντιλεγοι, επι την ὑποθεσιν επανηγαγεν
As often as any one opposed S. on any point, he would bring back the
αν παντα τον λογον.
conversation to the assumed principle.

Exercises.—Greek-English.

Ποτε μεν επ' ημαρ εἰχον, εἰτ' ουκ εἰχον αν. Αναλαμβανων ὁ Σωκρατης τα των τραγῳδῶν ποιηματα, ἐιρηκα αν αυτους, τι λιγοιεν. Ουκ αν φομην. Ὁ Περσων βασιλευς ασμενος αν τους Αθηναιους εις την συμμαχιαν προσεδεξατο. Εδει, ω ανδρες Αθηναιοι, τους λιγοντας ἁπαντας εν ὑμιν μητε προς ἐχθραν ποιεῖσθαι λογον, μητε προς χαριν. Ει δε τουτ' ἰποιει ἑκαστος, ενικων αν. Ουκ ἐχρην ποτε των πραγματων την γλωσσαν ισχυειν πλειν. Εμοι δε κε ταῦτα μελησεται. Εξημαρτε τις ακων· συγγνωμη αντι τιμωριας τουτῳ. Τί δ' ουκ οιδα; Τί ἐχρην με ποιεῖν; Τί ου μελλει γελοιον εἶναι; Πῶς ουκ ενδεχεται σωφρονησαντα προσθεν αῦθις μη σωφρονεῖν; Ου γαρ πω τουσγε ἰδον ανερας (ανδρας) οντι ἰδωμαι. Ιωμεν. Αγε σκοπῶμεν καθ' ἑν ἑκαστον. Φερε ἐγ πειραθῶ προς ὑμας απολογησασθαι. Ἁ μη κατεθου μη ανελῃ. Καν μονος ᾖς, φαυλον μητε λεξῃς μητε ἐργασῃ μηδεν. Ου μη σοι (ου φοβος ἐστι μη σοι) ἐνιωνται αντεχειν οἱ πολεμιοι. Μη ου ταῦτ' ᾖ χαλεπον, θανατον ἐκφυγειν, αλλα πολυ χαλεπωτερον (ἐκφυγειν) πονηριαν. Ου μη ἐσπλαγῇς, ενδε μη αισχυνθῇς. Ισως αν τινες επιτιμησειαν τοις ἐιρημενοις. Χειρισοφος ἡγοῖτο. Οἱ κακοι ουποτ' ευ πραξειαν αν. Τα ηδη γεγενημενα ουκ αν δυνηθειμεν κωλῦσαι. Απελθοις αν. Ουκ αν αποφευγοις την νοσον. Παντες αν ὁμολογησαιτε ὁμοιοαν μεγιστον αγαθον εἶναι πολει. Ει τοῦτο ἐλεγες, ἡμαρτανες αν. Ει τοῦτο ἐλεξας, ἡμαρτες αν. Εχαρης αν. Ειθε τοῦτο ἐγιγνετο, Ενυχης αν ην. Ει τοῦτο λεγοις, ἁμαρτανοις αν. Ει τι ἐχοις, δοιης αν. Χαιροις αν. Ἡδεως αν τοῦτο ακουσαιμι. Γενοιτ' αν πᾶν εν τῳ μακρῳ χρονῳ. Ειθε τοῦτο γιγνοιτο. Ει τι εἶχιν, ἐφη, δοῦναι αν. Ει τι εἶχον, ἐδωκα αν. Ει τι ἐχοι, ἐφη. δοῦναι αν. Ει τι ἐχοιμι, δοιην αν. Δῆλος εἶ ἁμαρτανων αν, ει τοῦτο λεγοις.

English-Greek.

They would rejoice. They would have rejoiced, had their parents come. He would be glad to hear those songs. If I have any, I will give soma. If I had any, I would give soma. If I had any, I would have given soma. Would that these things could be! May that come to pass! If they said that, they sinned, but they did not say it. May they be happy! Suppose that they advisedly sinned? Well! they left the house. Not know? How could I help it? Men once wise must be wise a second time. I never yet saw such women, nor do I expect to see such. Come let us draw up the soldiers. My children, though you are alone, neither do nor say anything bad. Thy son cannot oppose thee. Thy son may oppose thee. Thy son might oppose thee. Thy son might have opposed thee. Xenophon may lead the way. I wish they were gone. They would all confess, that friendship and wisdom are the greatest good of life.

Vocabulary, Questions, etc.

Ποτε μεν, now I had enough for the day, and now frequently I had not (I would not have.)
Ουκ αν φομην, I could not have thought it.
Προς ἐχθραν, etc., under the influence of hatred.
Τί δ' ουκ οιδα; how can I avoid knowing this?
Χειρισοφος ἡγοῖτο, Cheirisophus may lead the way; hence by an easy inversion, *may Cheirisophus lead the way.*
Εχαρης αν, you would rejoice (that is *if you knew all*).
Ειθε τοῦτο ἐγιγνετο, literally, *if that happened, O that (ειθε) this could happen: but it cannot! ειθε τοῦτο γινοιτο, may this happen: and who knows but it may.*
Ει τι ἐχοις, δοιης αν, if you had any you would give some, and *you may have some.*
Ἡδεως αν τοῦτο ακουσαιμι, gladly, if permitted, would I hear this.
Ει τι εἶχον, ἐδωκα αν, if I had any, as I have not, I would have given some: which now I cannot do.
Ἁῆλος εἶ, etc., *you clearly sin in saying this.*

What part of the verb is—*διηρωτα? προσεδεξατο? ενικων? ἐχρῆν? μελησεται? σωφρονησαντα? σκοπῶμεν? λεξῃς? αντεχειν? ἡγοῖτο? γεγενημενα? ὁμολογησαιτε? ἡμαρτανες.*

Why is *αν* used, and what is its force in these sentences? *ἐδωκα αν? δοῦναι αν? χαιροις αν? αν προσεδεξατο? δοιηρωτα αν? αποφευγοις αν? ενικων αν?*

LESSONS IN SPANISH.—No. IV.

Degrees of Comparison.—*Continued.*

Most adjectives may have their superlatives formed by *muy* prefixed, or by the ending *isimo*. There are a few, however, such as those ending with *ial* and antepenults (*i. e.* those accented on the last syllable but two) ending with *co, go, lo*, which form their superlative absolute always with *muy*; as, *social*, social; *muy social* (and not *socialísimo*), very social; *magnífico*, magnificent; *muy magnífico*, very magnificent; *pródigo*, prodigal; *muy pródigo*, vary prodigal; *gárrulo*, garrulous; *muy gárrulo*, very garrulous. As a general rule, adjectives of many syllables form the superlative absolute by *muy* and not with *ísimo*. The superlative of *mucho*, much, is always *muchísimo*.

The superlative relative is formed by placing the definite articles before *mas* (more) or *ménos* (less), and putting these before the adjective; as,

El Judío es el mas rico *de todos*, the Jew is *the most rich* (the richest) of all.
La madre del Francés es la mas rica *de todas las mugeres*, the mother of the Frenchman is *the richest* of all the women.
Mis hijas son las ménos doctas *de todas las doncellas*, my daughters are *the least learned* of all the maidens.

Remark.—Some of the adjectives have, besides the regular superlative absolute, also an irregular one, derived from some ancient form of the adjective; as, *fidelísimo*, very faithful; *bonísimo*, very good. The regular superlative of these adjectives is *fielísimo* and *buenísimo*, from *fiel*, faithful, and *bueno*, good. The irregular forms in general use are few, and are all to be found in Spanish dictionaries; therefore they offer no impediment to the student.

Vocabulary.

Alto, high, lofty.	*Brillánte*, brilliant.
Culpable, culpable.	*Gárrulo*, garrulous, talkative.
Amable, amiable.	*Armonióso*, harmonious.
Bello, fine, elegant.	*Benígno*, benign.
Escrupuloso, scrupulous.	*Alemon*, German.
Todo, every, all.	*Sombrero*, hat.
Sol, sun.	*Leon*, lion.
Luna, moon.	*Bestia*, beast.
Estrella, star.	*Torre* (fem.), tower.
Planeta (masc.), planet.	*Monte*, mountain.
Prudéncia, prudence.	*Génio*, genius, disposition.
Tesoro, treasure.	*En*, in, on.
El médico halló, the doctor found.	*Los médicos hallaron*, the doctors found.

Spanish-English.

La muger as muy amable. El juez es muy viejo. La Francesa es muy vieja. El criado es muy culpable. La lénguas aspañola[1] es bella y muy armoniosa. La luna es muy brillante. Las estrellas son muy brillantes. Las torres son altísimas. Las Españoles son muy sobérbias. El juez es muy escrupuloso. La casa es altísima. El buey es tan fuerto como al caballo. El caballo es tan viejo como el buey. El pintor es mas robusto que el impresor. Las criadas de la

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Española son mas gárrulas que los criados del Aleman. El sol es mas brilliante que la luna. La luna es ménos brilliante que el sol. La hija del médico es ménos hermosa que la hija del juez. Las casas no son tan altas como las torres.

English-Spanish.

The mountain is very high. The male-servant is very old. The Spanish[2] language[1] is elegant and very harmonious. The sun is most brilliant. The stars are very brilliant. The painter is as proud as the judge. The horse is as strong as the ox. The carpenter is as rich as the printer. The daughters of the German-woman (*Alemana*) are less culpable than the daughters of the Spanish-woman (*Española*). The stars are less brilliant than the moon. The moon is less brilliant than the sun. The carpenter is more ignorant than the painter. The lion is stronger than the horse. The judge is wiser than the physician.

OF THE PRONOUN.

There are six sorts of pronouns: *personal*, *possessive*, *relative*, *interrogative*, *demonstrative*, and *indefinite*. *Possessive*, *demonstrative*, and *indefinite* pronouns are a species of defining adjectives.

Personal Pronouns.

The personal pronouns are—*yo*, I; *tú*, thou; *usted*, you; *él*, *ella*, *ello*, he, she, it; *nosótros* (masc.), *nosótras* (fem.), we; *vosótros* (masc.), *vosótras* (fem.), ye; *ustedes*, you; *ellos* (masc.), *ellas* (fem.), they; *se*, himself.

Nos is sometimes used in the nominative for *nosotros*, but only when a nation or body of men issue some proclamation or law; as, "we (*nos*) the representatives of Mexico."

Vos was anciently used in the nominative for *vosotros*, but is now used only in addressing the Deity and celestial beings, or persons of very superior rank.

Usted is the only word with which persons address and are addressed in ordinary conversation in Spanish. It is a contraction of *vuestra merced* (your worship); and though it is always to be translated by the second person (you) in English, it is of course of the third person, and requires its corresponding possessive pronoun and the verb to which it may be the nominative, to be in the third person. In writing, *usted* is nearly always abreviated into *v.*, *vm.*, *vmd.*, *vd.*, *V.*, *Vm.*, *VM.*, *Vtra*, or *Md.*; and the plural (*ustedes*) into *vv.*, *vms.*, *vmds.*, *VV.*, *Vms.*, *Vmds.*;* as, *¿Como está vmd.? ¿Como va su salud?* literally, How is your worship? how goes his health? or as we should render it in English, How are you? how is your health?

The personal pronouns have two forms of the objective case, the *direct* and the *indirect*; the first governed by the verb or the preposition *to*, *understood*, and the second always governed by a preposition before it, *expressed*; as,

1st. *Juan* me *dió un libro*, John (to) *me* gave a book.
2nd. *Juan vino por* mí, John came for *me*.

The personal pronouns are declined as follows:—†

First Person.

Singular.	Plural.
Nomin. *Yo*, I.	*Nosotros*,—*as*, we.
1st Obj. *me*, mo, to me.	*nos*, us, to us.
2nd Obj. *á mí*, to mo.	*á nosotros*,—*as*, to us.

Second Person.

Nomin. *tú*, thou.	*vosotros*,—*as*, you.
1st Obj. *te*, thoe, to thee.	*os*, you, to you.
2nd Obj. *á ti*, to thee.	*á vosotros*,—*as*, to you.

Third Person Masculine.

Nomin. *él*, he.	*ellos*, they.
1st Obj. *le*, him, to him.	*los*, them; *les*, to them.
2nd Obj. *á él*, to him.	*á ellos*, to them.

Third Person Feminine.

Nomin. *ella*, she.	*ellas*, they.
1st Obj. *la*, her; *le*, to her.	*las*, them; *les*, to them.
2nd Obj. *á ella*, to her.	*á ellas*, to them.

Third Person for Indefinite Objects.

Nomin. *ello*, it.	[Wanting in the plural.]
1st Obj. *lo*, it.	
2nd Obj. *á ello*, to it.	

Third Person in Addressing.

Nomin. *vmd.*, your worship, you.	*vmds.*, your worships, you.
1st Obj. *le*, your worship, to you.	*les*, your worships, to you.
2nd Obj. *á vmd.*, to your worship, to you.	*á vmds.*, to your worships, to you.

Third Person Reflective.

Singular and Plural.

1st Obj. *se*, himself, herself, itself; themselves.
2nd Obj. *á sí*, to himself, to herself, to itself; to themselves.

A pronoun of the first-objective case is placed before the verb which governs it, except with infinitives, imperatives, and gerunds; as,

El hombre me *dijo*, the man said *to me*.	*Los perros* los *siguieron*, the dogs followed *them*.
La muger la *halló*, the woman found *him*.	*El médico* les *dijo*, the doctor said *to them*.

If the sentence begin with a verb, the pronoun is allowed to come after it; in other words, a pronoun of the first-objective case may or may not *begin* a sentence. When the pronoun comes after the verb, it is joined to it, and both form one word; as,

Nególes el cielo este gozo, denied-*them* heaven this pleasure.*

The first-objective case is employed in Spanish, when in English either the verb or the preposition *to*, expressed or understood, governs the personal pronouns; as,

Pablo me *mandó*, Paul commanded *me*.	*Juan* te *dió un libro*, John gave (*to*) *thee* a book.
La criada me *trajo un pañuelo*, the maid-servant brought (*to*) *me* a handkerchief.	*El sastre* nos *vió*, the tailor saw *us*.
	Los pastores nos *hablaron*, the shepherds spoke *to us*.

When in English the personal pronouns of the *third person* are governed by the verb, in Spanish *le* and *los*, for the masculine, and *la*, *las*, for the feminine, are used; as,

La muger le *vió*, the women saw him.	*El viajante* los *halló*, the traveller found *them*.

When in English the personal pronouns of the *third person* are governed by the preposition *to*, expressed or understood, in Spanish *le* and *les* are used for both genders; as,

El juez le *dijo*, the judge said *to-him* (or *to-her*).	*Los libreros* les *dieron libros*, the booksellers gave (*to*) *them* books.

A personal pronoun of the second-objective case is placed after a preposition; as,

Cayó temor sobre *él*, fear fell *upon him*.	*El pintor lo hizo* para *mí*, the painter made it *for me*.
Vino temor sobre todos los vecinos de ellos, fear came upon all the neighbours *of them*.	*Yo aceptaré el favor* de vmd., I will accept the favour *of your worship*.†

* These contractions are always pronounced *usted* and *ustedes*, just as in English the contractions *Mr.* and *Messrs.* are pronounced as if written in full.

† We have here used only the preposition *á* before the indirect or second objective, though any other preposition would require the same case; as, *de él*; *por ellos*; *para mí*.

* That is, as it would be properly expressed in English, "heaven denied them this pleasure."

† That is, "I will accept your favour."

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If in English two objective cases of personal pronouns are in the same sentence, one of them governed by the preposition *to*, understood, and the other by a verb, the one governed by the preposition is placed first; as,

María me *lo dió*, Mary (to) *me* it gave (or, Mary gave it *to me*).	*Pedro* les *la llevó*, Peter (to) *them* her brought (or, brought her *to them*).

If the pronoun be reflective, that is, if the nominative and objective cases refer to the same person, the reflective pronoun must come before the other, if another be used in the same sentence; as,

El cura se *me dirigió*, the rector addressed *himself* to me.

When, in the second-objective case, any one of the pronouns *mí, tí, sí*, is preceded by the preposition *con* (with), this preposition is prefixed to the pronoun, and the syllable *go* affixed, the whole forming one word; as,

Juan vino conmigo, John came *with-me*.	*Ella vino* contigo, she came *with-thee*.

The first-objective case of the personal pronouns comes after *infinitives*, *imperatives*, and *gerunds* * of the verb, forming one word with the verb; as,

El muchacho vino por verlos, the lad came to see-*them*.	*Tradídmele*, bring-*me*-*him*, *i. e.* bring *him to-me*.
Dame dinero, Give-*me* money.	*Entónces Pedro tomándole aparte, comenzó á reñirle*, then Peter, taking-*him* apart, began to chide-*him*.
Edgame vmd. † *una casaca*, make-*me*, your worship, a coat.	

When one verb governs another in the infinitive, the objective pronoun may come before the first or after the second verb; as,

El Aleman la *va á ver* or, *el Aleman va á verla*, the German *her* goes to see, or, the German goes to see-*her*.

The first or second person plural of the imperative drops its final letter when *nos* or *os* is joined to it; as,

Sentámonos, and not *sentámos-nos*, let-us-seat-ourselves.	*Guardáos*, and not *guardádos*, guard-yourselves.

Ello, and its objective case *lo*, are properly used for a noun to which we cannot assign any gender; thus, if we should tell a man "I am ill," and he should reply, "I am sorry for *it*," we perceive that the word *it* cannot be considered masculine or feminine, and in such a case in Spanish *lo* (not *le* nor *la*) would be used. Though not strictly correct, the practice is allowed of using *lo* for the masculine *le*, if this pronoun be directly governed by a verb.

Personal pronouns must always agree with the nouns for which they are substituted, in gender, person, and number. Thus, if it is said, "John lost his pen (*pluma*) and Peter found *it*," the pronoun *it* must be rendered, in Spanish, by *la*, because *pluma* is feminine.

Vocabulary.

Confianza, confidence.	*Para*, for.
Alguno, some, any.	*Mucho*, much, many.
Habló, (he) spoke.	*Hablaron*, (they) spoke.
Vió, (he) saw.	*Hizo*, (he) made, (he) did.
Vino, (he) came.	*Vinieron*, (they) came.
Yo‡ *soy*, I am.	*Tú eres*, thou art.
Nosótros somos, we are.	*Yo voy*, I go, I am-going.
Traed, bring (ye).	*Comprar*, (to) buy.
Dar, (to) give.	*Hablar*, (to) speak.
Ver, (to) see.	*Pedro*, Peter.

* A *gerund* is used in Spanish as the present participle in English; as, *amando*, loving.

† *Vmd.*, though always used in such cases, is not to be rendered in English; thus the above means, "make me a coat."

‡ For the present, we shall use the nominative personal pronouns with the verb, though they are not in general required.

Spanish-English.

[The personal pronouns are in Italics.]

Pedro *me* escribió dos cartas. *Ella le* dió un libro. *El los* halló. *Ella les* escribió algunas cartas. El médico *les* habló. *Yo* soy pobre y viejo. *Tú* eres muy sábio. *El* es ignorante. *Nosotros* somos fuertes y ricos. El pintor *te* dió una cuchara de plata. La muger *nos* vió. El carpintero *nos* habló. Los Españoles *le* hablaron.

[In forming a negative sentence, the adverb *no* must come not only before the verb, but even before personal pronouns of the first-objective case; as, *Juan no me lo dijo*, John not to-me it said, *i. e.* John said it not to-me; or as it would be commonly expressed in English, John did not say it to me.

Vmd. (pronounced *ustéd*) is generally used in common conversation, and though of the third person, is equivalent to the English word *you*: thus the sentence, "you are rich," if addressed to one person, would be, *vmd. es rico* (your worship is rich); if addressed to more than one person, *vms. son ricos* (your-worships are rich). When females are referred to, the feminine form of the adjective must be used.]

Vmd. es muy sábio. *Vmd.* tiene hambre. *Vd.* me dió un libro. *Vm.* tiene una casa. *Vms.* tienen sed. *Vms.* aman la verdad. *Vms.* no son sobérbios. El juez tiene mucha confianza en *vd.* Pedro *le* dió el libro. El Aleman no *le* dió dinero. La Alemana no *le* habló. La muger no *me* habló. El pintor no *te* vió. El carpintero no *los* halló. *Yo* voy á dar*le* un libro. *V.* es rico. *VV.* son pobres. *Vds.* son sobérbios.

English-Spanish.

Peter wrote me two letters. The painter gave him a book. She found them. He wrote to-them some letters. I am old and poor. The judge spoke to-them. Thou art very rich. He is wise. We are ignorant. They are strong and rich. The painter gave thee a silver spoon. The woman saw us. The carpenter spoke to us. The Spanish-woman spoke to him. The physician saw him. The French-woman saw them (masc.) The German-woman saw them (fem.) The carpenter made it (*lo*) for him. The painter has confidence in her. The printers have much confidence in him. The Englishman made it for me. The physician has much confidence in them (masc). The mother of the painter has much confidence in us. The Spaniard saw her. The Frenchman saw them. Peter saw him. They spoke to-me.

[The remaining exercises in this lesson are to be rendered by *vmd.* and its objective cases, when the second person *you* occurs in English. Instead of *vmd.*, any of the other abbreviations, *V.*, *Vd.*, *Vm.*, (all pronounced *ustéd*), may be used; and instead of *vmdes.*, the other abbreviations in the plural, *VV.*, *Vs.*, *Vms.*, *Vds.*, may be used.]

You gave me a book. You are very wise. You are hungry. You have a house. You (plur.) are thirsty. You (plur.) are not proud. You (plur.) love the truth. The physician has much confidence in you. The judge gave you the book. The Englishman did not give you (*le*) money. The painter did not speak to-you (*le*). The woman did not speak to-you (plur.). She did not speak to-me. The painter did not see these. The carpenter did not find them. I am-going to give you (*le*) a book. Peter saw you (*le*).

FRENCH READINGS.—No. XXVII.

LE CHIEN DU LOUVRE.

Section II.

Quand sur ces touffes d'immortelles[a]
Brillent d'humides étincelles[b]
Au point du jour,
Son œil se ranime; il[c] se dresse[d]
Pour que son maître le caresse[e]
A son retour.

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Au[1] vent des nuits, quand la couronne
Sur la croix du tombeau frissonne,
Perdant l'espoir,
Il veut que son maître l'entende,[3]
Il gronde, il pleure, il lui demande
L'adieu du soir.[4]

Si la neige avec violence
De ses flocons couvre en silence
De lit de mort,
Il pousse un cri lugubre et tendre,[5]
Et s'y couche pour le défendre[6]
Des vents du Nord.
Avant de fermer la paupière,
Il fait pour soulever la pierre
Un vain effort;[7]
Puis il se dit, comme la veille,
Il m'appellera, s'il s'éveille.[8]
Puis il s'endort.[9]

La nuit il rêve barricade:[10]
Son maître est sous la[e] fusillade,[11]
Couvert de sang.
Il l'entend qui siffle dans l'ombre.[12]
Se lève et saute après son ombre[13]
En gémissant.

C'est là qu'il attend d'heure en heure,[14]
Qu'il aime, qu'il souffre, qu'il pleure,
Et qu'il[f] mourra.[15]
Quel fut son nom? C'est un mystère![16]
Jamais la voix qui lui fut chère
Ne le dira.[17]

Passant que ton front se découvre;
Là plus d'un brave est endormi,
Des fleurs pour le martyr du Louvre,
Un peu de pain pour son ami.

C. DELAVIGNE.

COLLOQUIAL EXERCISE.

1. Que fait le chien au point du jour?
2. Pourquoi se dresse-t-il?
3. Que fait-il quand le vent agite la couronne de fleurs du tombeau?
4. Que demande-t-il à son maître?
5. Que fait-il quand la neige couvre le tombeau?
6. Pourquoi s'y couche-t-il?
7. Que fait-il avant de fermer la paupière?
8. Que se dit-il ensuite?
9. Ensuite, que fait-il?
10. Que rêve-t-il la nuit?
11. Où croit-il voir son maître dan ses rêves?
12. Que croit-il entendre?
13. Que fait-il, croyant l'entendre siffler?
14. Que fait-il sur le tombeau?
15. Que deviendra-t-il?
16. Sait-on son nom?
17. Pourra-t-on jamais l'apprendre?

NOTES AND REFERENCES.—*a.* immortelle, *cassidony, eternal flower.*—*b.* d'humides étincelles, *liquid sparks.*—*c.* se dresse, *arises.*—*d.* au, *in the.*—*e.* sous la fusillade, *exposed to the fire (of muskets).*—*f.* from *mourir*; L. S. 60, R 2.

HINTS ON PAINTING.

WE shall now proceed to notice some of the peculiar modes of painting adopted; and, first, offer some remarks on fresco-painting.

FRESCO-PAINTING

is the application of colours ground in water to a freshly-plastered wall, with which they become incorporated to a sufficient depth to be as permanent as the plaster itself. The chief difficulty in the process consists in the necessity of completing the picture by portions, while the plaster is still moist; so that as much only of the plaster can be applied in the morning as the artist may be able to deal with in the day. This is the last or finishing coat of plaster, and requires to be very thinly and evenly laid upon others of substantial mortar, which should be previously applied and finished in the usual manner of a carefully-prepared wall.

The durability of fresco-paintings is so dependent upon the preparation of the wall, that the utmost care in this particular is necessary. The quality of the lime, sand, and all the materials employed, should be unquestionable; and none but the most skilful and reliable workmen should be trusted in the work. The final coat of plaster should be laid under the artist's eye, if not by his own hand.

The progress of a work in fresco being thus by portions, each of which must be completed at once, renders it necessary that a cartoon or drawing of the whole should be previously prepared, as well as that the arrangement of colour and general effect should be decided beforehand. These cartoons require to be made on strong paper. Over the last rough plastering a general indication of the whole subject should be traced. One method is to prick the outlines through with a needle to a separate sheet of paper, and, by means of a small bag of thin muslin with powdered charcoal, to pounce the outline through to the wall; or to trace it thereon with a blunt point or stylo, which is the most common practice

The final coat of plastering laid over just sufficient space for a day's work, a more elaborate tracing is made thereon, and the artist proceeds, with all possible celerity, with his work, in which a greater difficulty occurs with regard to the appearance of the colours in a wet state than in tempera; for allowance has not only to be made for the variation between a pigment, or tint, in a moist or dry state, but for the peculiar action thereon, both by the lime and absorption of the wall.

The colours are ground in water, and kept ready for use in pots. No size is necessary, except perhaps a very little for such pigments as ultramarine, charcoal black, &c.; the adhesive property of lime combined with water being the only reliable medium for colour in fresco, and its durability being dependent upon its perfect incorporation with the plaster.

Not only the original pigments, but also as many tints and combinations as may be required, should be previously prepared in cups, so as to insure uniformity and harmony in the picture.

The best method of testing a tint is to touch it on a lump of dry umber, which instantly imbibes the water, and shows very nearly how it will appear when dry. Besides the cups, a tin palette may be requisite, with a cup in the middle for water.

The tints require to be laid on rapidly and at once. The first applied will strike in and be absorbed, and it is only by repetitions that a permanent tint can be obtained.

The brushes employed in fresco are similar to those used in oil; square or flat brushes, with long bristles or hair, are requisite for broad tints.

The COLOURS which can be used with safety in fresco are few, and only such as are not injuriously affected by the action of lime. For this reason, many of the most brilliant, which may be employed in other methods, must be excluded from fresco.

For *Yellows* the varieties of native ochres afford very ample resources; Naples yellow, in interior works, may be used with safety.

Reds are supplied from the ochres calcined, and the oxides of iron. Burnt Terra di Siena is an invaluable colour for fresco.

Ultramarine, either the genuine preparation from Lapis-Lazuli or the French and German imitations of it, is almost the only pure blue that can be employed.

For *Greens*, Terra-verde is a most reliable pigment; certain oxides of copper may be employed, but great care is requisite in their management.

The *Blacks* are many: charcoal, both in its pure state and in combination, will be found very serviceable; also burnt lamp-black.

The only *White* that can be safely employed is a purified preparation of lime; and the utmost precaution is necessary that it should be of good quality. Many artists prefer the lime of the best oyster-shells, having them carefully washed, and afterwards burnt.

Pictures may be painted in fresco on a substantial lathing, or upon iron or copper frames with a wire-worked foundation; the plaster being thereon laid, and the process conducted precisely as on a wall; and the picture, when completed, may be set in its place as permanently as if painted directly on the wall itself. This method offers not only the advantage that the picture can be completed in the studio, but also affords greater facility in its execution, from the fact that the drying of the plaster can be retarded by wetting it from the back of the picture, hanging before it, during suspension of work, wet cloths, &c., and thus enabling the artist to devote two or three days to each portion.

As those who may desire to attempt fresco-painting to an ambitious extent will be led to seek more ample directions on the subject than can possibly be afforded by a mere sketch, we leave the subject with sufficient for at least a trial, and with the assurance that they will find fresco-painting, like all other methods, simple and easy to any one skilful in design, and practically as well as theoretically conversant with the leading principles of the art of painting by any other method.

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ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LX.

(*Continued from page* 100.)

VARIOUS EFFECTS OF STATICAL ELECTRICITY.

Physiological Effects.—The effects of statical electricity are divided into physiological, luminous, calorific, mechanical, and chemical. Physiological effects are those produced by electricity upon living creatures, or such as have only lately been deprived of life. They consist, in the case of the first, of a violent shock produced by the electric fluid upon the sensibility and contractility of the organic tissues, and, in the case of the latter, of sharp muscular contractions presenting the appearance of restored vitality. The shock communicated by the electric spark acquires increased intensity and a peculiar character when it is elicited by means of the Leyden jar, touching the external armature with one hand and the internal with the other. The Leyden jar is capable of giving a shock to a great number of persons at once. For this purpose, they must form a chain by taking hold of each other's hands. Then the first touches the external armature of a jar that has been charged, and the last touches the knob of the internal armature, and all receive the shock at once. The abbé Nollet thus gave a shock to an entire regiment of fifteen hundred men. Priestley killed rats and cats with jars of a great dimensions.

Luminous Effects.—The recombination of the two electricities,

Fig. 410.

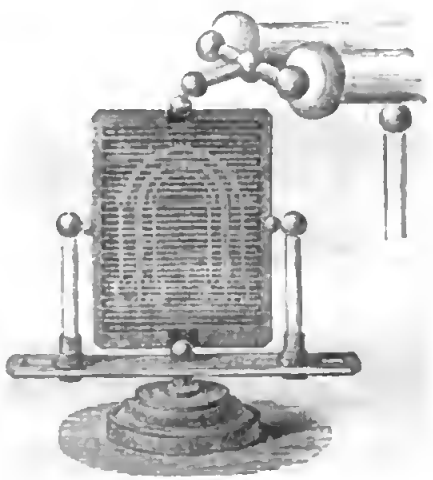


when in a state of great tension, is always accompanied by the disengagement of light more or less intense, as is seen in the sparks elicited from the Leyden jar and the electrical machine. The spark is brighter in proportion as the bodies between which it appears are good conductors, and the colour of it varies, not only with the nature of these bodies, but with the surrounding atmosphere and the pressure. The spark produced by two pieces of coal is yellow, between two balls of copper plated with silver, green, between balls of wood or ivory, crimson. In air, at the ordinary pressure, electric light is white and brilliant, in rarefied air it is reddish, in vacuo, violet colour, owing to the circumstance that the feebler the resistance to the recombination of the two electricities, the less tension does electricity acquire. In carbonic acid, the spark is white, as in air; in hydrogen, it is reddish, and in mercurial vapour, green. In general, the brightness is proportional to the tension.

The effects of the pressure of the air upon the brightness of electric light are studied by means of the *electric egg*, which is a glass globe upon a copper support, in which are two brass rods with a ball at the end of each, fig. 410. The lower rod is fixed, and the upper rod slides up and down, so as to be capable of being brought nearer or removed further away, as may be required. A vacuum is produced in the ball by means of the air-pump, to which it may be screwed, and the upper end is brought into communication with a powerful electrical machine, and the stand with the earth. On then charging the machine, you will observe a violet-coloured light, not very intense, passing from one ball to the other. This arises from the recombination of the positive fluid of the upper ball with the negative fluid of the lower. If you gradually admit the air, by means of a plug or tap fitted to the foot of the apparatus, the tension increases with the resistance, and the light, which becomes white and brilliant, appears under the form of an ordinary electric spark.

The Sparkling Tube.—The philosophers of the last century invented several apparatus for producing various luminous

Fig. 412.



effects in darkness by means of the electric spark. We may first mention *the sparkling tube*, which consists of a glass tube about three feet and a quarter long, in which are stuck a series of tin-foil lozenges, arranged in a spiral form all along the tube,

Fig. 411.



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so closely as to leave very little space between them. Hold the tube at one end, and bring the other near an electrical machine, as in fig. 411, and sparks will appear at all the interstices at once, producing a brilliant trail, especially in the dark.

The Magic Square, which is based upon the same principle as the sparkling tube, is composed of an ordinary square of glass, upon which is stuck a very narrow strip of tin-foil winding round many times parallel to itself, as seen in the black line in fig. 412. On this hand a number of very thin strokes are cut with a sharp instrument, arranged in such a manner as to represent a definite object, as *e.g.* a portico, a flower, etc.; then fixing the square between two glass columns, put the upper extremity of the strip of tin-foil in communication with an electrical machine and the other with the earth. On turning the plate of the machine, a spark will appear at every part of the tin-foil that has been cut, and produce in lines of fire the object drawn upon the glass.

The Sparkling Jar is a Leyden jar whose external armature is formed of a layer of varnish upon which metallic dust has been deposited. A tin band stuck to the lower edge of the jar is in communication with the earth by means of a metal chain. A second band placed higher up has a piece attached to it which reaches within about three-quarters of an inch of the hook, which is very much bent. This jar being attached to an electrical machine, fig. 413, as the latter is charged, the spark

Fig. 413.



appears between the hook and the armature, and long and brilliant sparks are seen all over the apparatus.

Calorific Effects of Electricity.—The electric spark is not only luminous, but also the source of an intense heat. In passing through combustible liquids, such as alcohol and ether, it sets them on fire. It has the same effect upon gunpowder and pulverised resin, and even melts metals if it be produced by a powerful battery. An ordinary Leyden jar is sufficient to set fire to alcohol or ether by means of the small apparatus represented in fig. 414. It is a small glass vessel, with a copper rod passing through the bottom and terminating in a knob. The vessel is fixed upon a copper stand. Having poured the liquid into the vessel so as completely to cover the knob, bring near it the hook of a charged Leyden jar, taking care to make the copper stand communicate with the external armature by means of a metallic wire. This chain and the stand fulfilling the office of the exciter, the spark darts through the liquid and sets it on fire. With ether the experiment succeeds very well; but to make it succeed with alcohol, it is necessary first to warm the liquid.

When the discharge of the battery takes place along a thin iron or steel wire, it becomes reddish-white and burns with a dazzling light. Wires made of platina are melted and volatilised. Van Marum, with a powerful machine having two plates and a strong battery, melted an iron wire more than fifty feet long.

Fig. 414.

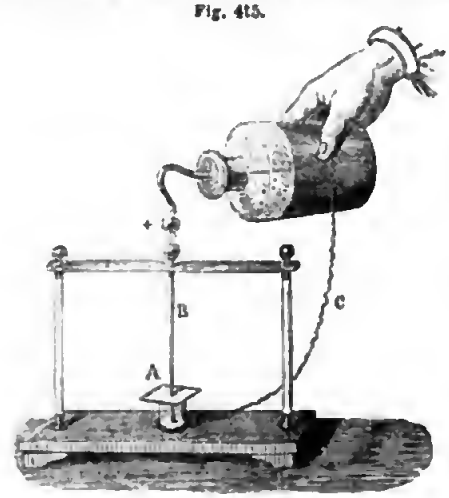


If gold leaf, isolated between two plates of glass or two silk ribands, is subjected to the discharge of a battery, the gold is volatilised, and leaves as a residue a violet powder, which is nothing more than gold very much divided. It is in this way that electric portraits are obtained.

Mechanical Effects.—The mechanical effects of electricity are the tearing, ruptures, and violent expansions which take place in bad conductors, in consequence of the passage of a strong electric charge through them. Glass is smashed, wood and stone are broken, gases and liquids violently agitated. The mechanical effects of the electric spark are exhibited by means of various apparatus, such as the *glass piercer*, the *card piercer*, *Kinnersley's thermometer*, and *the universal exciter*.

The glass piercer, represented in fig. 415, consists of two

Fig. 415.



glass columns which support a conductor B, by means of a horizontal transverse beam. The conductor terminates in a point, and the piece of glass which is to be pierced rests upon an isolating glass cylinder, in which is a second conductor also terminating in a point. This latter being put in communication with the external armature of a powerful Leyden jar by means of a metallic wire, bring the hook of the jar near the knob of the conductor B. A spark then appears between the two conductors, and the glass is pierced. The experiment, however will not succeed with a feeble Leyden jar, unless the glass is very thin. With a battery, glass is easily pierced.

The same apparatus serves equally well as a card piercer. It is customary, however, to give it a different form in this case, by having only one isolating column as the support of the

upper conductor, and placing the card slantwise between the conductors, taking care that the points of these latter do not exactly correspond. By this arrangement it is found that in air the hole made in the card is nearer the negative point, in vacuo or a rarefied atmosphere it is nearer the positive point.

The agitation and violent expansion to which the electric spark gives rise in gases is demonstrated by means of *Kinnersley's thermometer*. This apparatus is composed of a strong glass tube, fitted at its two ends into copper ferrules which hermatically close it, and support two conductors with a ball at the end, the one fixed, and the other sliding at pleasure in a leather case. From the bottom of the apparatus proceeds a second tube, rising by the side of the first and open at the top. Having unscrewed the leather case, pour water into the great tube till it rises to a little below the lower ball. Then fastening on the leather box, discharge a Leyden jar along the conductors by holding it as shown in the fig. 416. The water

Fig. 416.



will be immediately forced out of the large tube, and will rise in the small one to a height of about four-fifths of an inch; but the level will soon be restored, which shows that the phenomenon is not owing to the elevation of the temperature, and that consequently it is a misnomer to call the instrument a thermometer (or heat-measure).

The universal exciter has been already described in connexion with batteries, and a drawing of it has been given. Suppose you wish to break a piece of wood. Place it on the little plate on which the bird is represented, and make it touch the two balls of the conductors, then discharge the battery as shown in the drawing, and the piece of wood will be broken to pieces.

Chemical Effects of Electricity.—The chemical effects of electricity are the combinations and decompositions determined by the recombination of the two electric fluids in bodies. Oxygen and hydrogen combine in Volta's pistol through the passage of the electric spark. In general, when two gases are mingled nearly in the proportion according to which their combination takes place, a single spark is sufficient to determine it; but if the mixture deviates much from this ratio, the combination requires a long series of sparks. Priestley was the first to discover that on passing electric sparks for a long time through a determinate quantity of atmospheric air, the volume of air diminishes, and the tint of litmus, placed in the vessel containing it, becomes red. Cavendish having repeated this experiment with great care, found that when air or any of the bases are present, nitric acid is formed, resulting from the combination of the oxygen and nitrogen of the air.

A great number of gases are decomposed by the successive action of the electric spark. Carbonated hydrogen is completely so, but carbonic acid only partially, into oxygen and oxide of carbon. The electric spark decomposes even the oxides, water, and the salts; but statical electricity does not produce any thing like such powerful and varied effects as dynamical electricity.

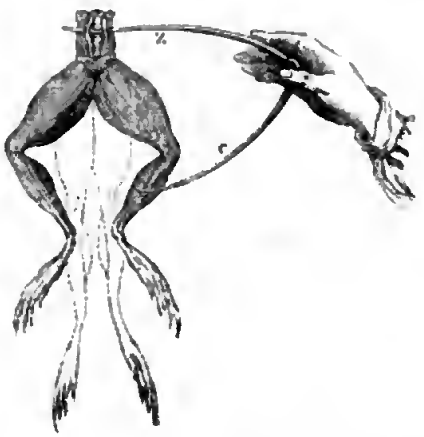
DYNAMICAL ELECTRICITY—THE VOLTAIC PILE

Galvani's Experiment and Theory.—We owe to Galvani, the professor of anatomy at Bologna, the fundamental experiment which has led to the discovery of dynamical electricity, or galvanism (so called after him), that new branch of natural philosophy so remarkable for the numerous applications that have been made of it within the last half century.

Galvani had been for several years studying the influence of electricity upon the nervous irritability of animals, particularly frogs, when in 1786 he observed that the lumbar nerves of a dead frog being in communication—by means of a metallic circuit—with the muscles of the thighs, the latter contracted with a lively movement.

To repeat the experiment, it is necessary to resort to the barbarous cruelty of skinning a frog while yet alive, and cutting it below the fore-legs, fig. 417. Then having laid bare the

Fig. 417.



lumbar nerves, which are situated on both sides of the vertical column in the shape of white threads, take a metallic conductor, formed of two arcs—the one of zinc and the other of copper—and introducing one between the nerves and the vertebral column, touch the muscles of one of the thighs with the other. On every repetition of contact, the muscles contract, and this part of the frog seems to be instinct with life and motion.

Galvani, who, even as far back as 1780, had ascertained that the electricity of electrical machines produced similar movements in dead frogs, attributed the phenomenon just described to the existence of a kind of electricity in the animal, and regarding the muscle as a Leyden jar and the nerve as a simple conductor, he considered that at the moment of contraction the positive fluid circulated from the nerve to the muscle along the metallic circuit, and from the muscle to the nerve in the body of the frog.

Many philosophers, and especially physiologists, adopted the theory of Galvani, applying the name of *Galvanic fluid or animal electricity* to the supposed electricity in the animal. It however met with several opponents, the most zealous of whom was Volta, professor of natural philosophy at Pavia, and already known by his invention of the electrophorus, the condensing electrometer, and the andromater.

Volta's Experiment.—The attention of Galvani was directed exclusively to the nerves and muscles of the frog; that of Volta to the metals which served to establish the communication. Starting from the phenomenon observed by Galvani, that the muscular contraction is much more energetic when the arc is composed of two metals than when there is only one, Volta attributed the active part of the phenomenon of contraction to the metals. He considered that it was through their contact that electricity was set free, and that the parts of the animal only fulfilled the office of conductor, and at the same time of a very delicate electroscope.

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By means of the condensing electrometer which he had just invented, Volta appeared to demonstrate by many experiments the development of electricity on the contact of the two metals. The following is one of them which may be easily repeated. Wet your finger and put it on the upper plate of the condensing electrometer, then touch the lower plate with a plate of scraped zinc which you hold in your hand. Then breaking the communications and taking away the upper plate, fig. 402, you will find that the pieces of gold leaf diverge, and are electrised negatively; which leads to the conclusion, that the copper, by its contact with the zinc, is charged with negative electricity, and the zinc with positive electricity. Further, in this experiment the electricity cannot be attributed to friction or pressure, for if you touch the plate of the condenser, which is made of copper, with a plate of the same metal, you will find no trace electricity.

A memorable contest then took place between Volta and Galvani. The latter maintaining his theory of animal electricity with a deep conviction of its truth, showed that the presence of two metals was not indispensable to the production of the phenomenon, and that contractions may be produced by placing a frog recently dead and prepared upon very pure mercury. Lastly, he showed that by bringing the lumbar nerves of the frog near the muscles of the legs, a lively contraction is produced immediately upon contact. Now in this last experiment the metals performed no part, and the theory of Galvani seemed to be victorious. But Volta then opposed it by extending his theory of contact and laying down this general principle, that *two heterogeneous substances, of whatever kind, being brought into contact are always reduced to a state of contrary electricity, the one being in a state of positive, and the other of negative electricity.*

Galvani, however, made a last experiment, in which it was impossible to maintain the notion of contact, because he touched only homogeneous substances. He placed upon a glass disc a frog's thigh having its lumbar nerve, and beside it a second thigh prepared in the same manner. Having placed the nerve of the second upon that of the first, so that at the point of contact there was nothing but nervous substance, he made the two thighs touch, and obtained a strong contraction. Galvani had consequently succeeded in demonstrating the existence of animal electricity, which has been established in our time by M. Matteuci, under the name of the *peculiar current* of the frog.

Volta's Theory.—Volta, who was pre-eminently a natural philosopher, and considered only the physical conditions of the problem, rejected the theory of animal electricity, and maintained that of contact alone, which may be comprised in the two following principles.

1. The contact of two heterogeneous bodies always gives rise to a force which Volta designated by the name of *electro-motive force*, and which has the property, not only of decomposing a part of their natural electricity, but also of opposing the combination of contrary electricities accumulated on the two bodies in contact.

2. When two heterogeneous substances are in contact, the difference of their electric state is constant, for the same bodies, in whatever conditions they are placed, and is equal to the electro-motive force. That is to say, if we take away from the two bodies, or communicate to them any quantity of electricity, the difference of their relative electric condition is not altered. In the former case, that is, when electricity is taken away—the electro-motive force immediately reproduces a quantity of electricity equal to that which has been withdrawn. In the latter case, in which electricity is communicated, the electricity added is diffused equally over the two bodies. So that in both cases the difference of the two electric conditions remains unaltered. For example, two discs, one zinc and the other copper, being brought into contact and both isolated, if we denote the positive electricity of the zinc by + 1, and the negative electricity of the copper by — 1, and communicate to this system a quantity of positive electricity represented by 20, we shall have 20 + 1 or 21 on the zinc, and 20 — 1 or 19 on the copper. Now the difference, which was 2 between the electric conditions + 1 and — 1, is still 2 between the electric conditions 21 and 19.

As the electro-motive force of Volta did not appear to set free the same quantity of electricity on the contact of all bodies, this philosopher divided bodies into *good* or *strong electromotors* and *feeble electromotors*. In the first class are metals and charcoal well burnt; in the second, liquids and non-metallic bodies in general. The metals themselves are not all equally good electromotors. Zinc and copper soldered together are the best. Lastly, the kind of electricity developed varies with the nature of the substances in contact. Zinc, iron, tin, lead, bismuth, and antimony are electrised positively on their contact with copper, while in the same circumstances gold, silver, and platina, are electrised negatively.

It was in endeavouring to support his theory of contact, that Volta was led to invent the marvellous apparatus which has immortalised his name. Even this theory, however, like that of Galvani, was not without numerous opponents, and it is to chemical action, as we shall hereafter show, that in the present day is attributed the liberation of electricity which Volta attributed to contact.

LESSONS IN FRENCH PRONUNCIATION.

No. VI.

69. DIPHTHONGS.

There are Six Diphthongs, viz.:—

IA IE IO UA UE and UI:—whose sounds we now proceed to illustrate.

But do not suppose that these combinations of Vowels are always Diphthongs in whatever place they are situated. If followed by two Consonants, the *first* of which is M or N, the *last* Vowel forms with the M or N, a Nasal, unless the M or N be doubled.

Sometimes, again, these Vowels which now appear as Diphthongs, are but parts of syllables of a word, and must be pronounced only as distinct Vowels.

IA.

Name. Sound.

IA. Like the sounds of the letters I in the English word FIG, and A in the word FAT, pronounced as one syllable. The sounds of both, however, must be distinctly heard without any hiatus between them.

French.	Pronunciation.	English.
Diable	Diabl'	*Devil.*
Criard	Kriar	*Clamorous.*
Coriacé	Ko-ria-say	*Tough.*
Fiacre	Fiakr'	*Hackney-coach.*
Iatrique	Ia-treek	*Iatrical.*
Piaffe	Piaf	*Ostentation.*
Tiare	Tiar (trill the r)	*Tiara.*
Viande	Viandh	*Meat.*

IE.

Name. Sound.

EE. Like the letters EE, in the English word BEE.

French.	Pronunciation.	English.
Académie	A-ka-day-mee	*Academy.*
Analogie	A-na-lo-zhee	*Analogy.*
Anomalie	A-no-ma-lee	*Anomaly.*
Aeie	A-zee	*Asia.*
Bonhommie	Bo-no-mee	*Good nature.*
Bonneterie	Be-nait'-ree	*Hosiery business.*
Cemédie	Ko-may-dee	*Comedy.*
Confiserie	Konh'-fiz-ree	*Art of making Confectionery.*
Démocratie	Day-mo-kra-see	*Democracy.*
Figuerie	Feeg'-ree	*A fig-garden.*
Pie	Pee	*A magpie.*
Vie	Vee	*Life.*

This combination is a very common ending of words in the

French language. The E, however, often bears the Acute Accent, thus—IE'. These Vowels also appear very often in the body of a word with the E accented. In such cases, they do not constitute a Diphthong, and cannot be illustrated by the sound of EE in English word BEE; but each preserves its own distinct Vowel sound

IO

Name. Sound.

EO. Like the letters IO, in the last syllable of the English word CUR-CU-LIO.

French.	Pronunciation.	English.
Approvisionner	A-pro-vec-zeo-nay	*To victual.*
Cautionné	Ko-seo-nay	*A Warrantee.*
Dénationaliser	Day-na-zeo-na-le-zay	*To denationalize.*
Mioche	Meo-sh (long o)	*A brat.*
Pioche	Peo-sh(long o)	*Pick-axe.*
Violon	Veo-lonh!	*Violin.*

This Diphthong retains the sound first illustrated, in most, if not all, endings in SION and TION.

UA.

This Diphthong has the combined sound of the French U, together with that of A in the English word FAT, unless the latter be under a Circumflex Accent; in which latter case, the A has the sound of A in the English word MARK.

French.	Pronunciation.	English.
E'cuage	Ay-kuazh	*Seutage; in Feudal Law.*
Empuanter	Anh!-puanh!-tay	*To infect.*
Guano	Gua-no	*Guano*
Huard	Uar	*Sea-eagle.*
Nuage	Nuazh	*Cloud.*
Puant	Puanh!	*Offensive.*

Sometimes this Diphthong has the sound of A in the English word FAT, viz. :—

Aiguade	Ay-gad	*A watering-place.*

To an Englishman, at least, the sound of a W is naturally suggested in the pronunciation of this Diphthong.

We might illustrate its sound by the use of a W in the above words, viz. :—

E'cuage	Ay-k'wazh
Empuanter	Anh!-p'wanh!tay.
Guano	Gwa-no
Huard	War.
Nuage	N'wazh
Puant	P'wanh!

This last illustration, however, is not strictly correct, because it does not preserve the distinct sound of the French U; which sound, especially in combination, many Frenchmen themselves are not careful to preserve. In common conversation, this Diphthong sounds like an English W.

In French words commencing with QUA, the Diphthong UA, has two different sounds. In some the sound of UA would be illustrated by the letters KOUA or K'WA;—but in others, by KA, viz.:

QUADRANGLE, is pronounced, KOUAH-DRANH!OL', or K'WAH-DRANH!OL'.

QUADRATURE, a Geometrical Phrase, is pronounced, KOUAH-DRA-TURE or K'WAH-DRA-TURE. But the same word, used as a term of horology, is pronounced, KAH-DRA-TURE.

QUAI a wharf, is pronounced KAY.

QUAICHE, a Naval term, meaning a Ketch, is pronounced KAISH.

Until the learner has become really familiar with the French language, the surest way to be correct in the use and pronunciation of words commencing with QUA, will be to consult a dictionary.

UE.

This Diphthong occurs most frequently, as the *final* letters of French words after the Consonants of G and Q;—in which cases both are silent.

When *final*, and before other Consonants, they have the usual sound of French U; examples of which will be given in future lessons.

UI.

This Diphthong has the combined sound of the French U, together with that of French I, which latter is like the letters EE, in the English word BEE.

French.	Pronunciation.	English.
Appui	A-pul or A-puee	*Support.*
Conduite	Konh!-d'weet	*Tube.*
Huit	Uet or Weet	*Eight.*
Lui	Luee or L'wee	*Him.*
Nuit	Nuee or N'wee	*Night.*
Oui	Ooee or Wee	*Yes.*
Puissance	P'wee-sanh!s	*Power.*
Ruine	Rueen or R'ween (trill the r)	*Ruin.*

The *ten* Diphthongal Combinations of THREE SUCCESSIVE VOWELS, in the same word, are thus divided to show their pronunciation, which will be further illustrated in future lessons, viz. :—

iai	i-ai	ea
iau	i-au	eo
ieu	i-eu	suh![a]
oua	ou-a	ooah or wah
oue	ou-e	ooay
oui	ou-i	ooe or wee
uai	u-ai	ua or wa
uei	u-ei	ua
uie	u-ie	uee or wee
ueu	u-eu	uuh![a]

Diphthongs of FOUR SUCCESSIVE VOWELS in the same word are thus divided for pronunciation, which latter—the pronunciation—will be amply illustrated in future lessons, VIZ. :—

ouai	ou-ai	oo-a
oueu	ou-eu	oouh![a]
ouee	ou-e	ooay.

70 NASAL VOWEL SOUNDS

The sound of { AM and AN / EM " EN / IM " IN } is represented by the letters ANH! and is like the sound of the letters AN, in the English words AN-CHOR and CAN-KER, with an effort to speak through the nose, as it is termed. But be particular to avoid the sound of English G IN ALL NASALS.

There is, strictly speaking, a real difference between the Nasal sounds of AN, EN and IN;—but it is so slight, and so peculiarly delicate, that scarcely any one not a native Frenchman can detect and describe it intelligibly. In *common reading* and *conversation*, these Nasals above-mentioned have but one sound, viz. :—that which has been assigned them in our previous Lessons. It is considered correct enough for all practical purposes.

When *extraordinary nicety* of pronunciation is demanded, as is always the case in using the language of prayer, and in holy and devotional language, the A of the Nasals AM and AN should be pronounced BROADER than the E or I in the Nasals EM, EN, IM and IN. In the former case, let the A

[a] Like the sound of E mute.

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have the sound of AH; in the latter, the sound of A in the word FAT.

The sound of { OM and ON } is represented by the letters ONH!, and is like the sound of the letters ON, in the English word CON-QUER, uttered with an effort to speak through the nose, as it is termed.

The sound of { UM and UN } is represented by the letters UNH!, and is like the sound of the letters UN, in the English word UN-CLE, uttered with an effort to speak through the nose, as it is termed.

Concerning these Nasals, remember these two General Rules, viz.:

I.

Single M's and N's followed by Vowels are not Nasals.

II.

When the M and N are doubled, the Nasality is destroyed.

Exceptions to this last Rule will appear in their proper places.

We now proceed to illustrate these Nasal sounds.

AM.

French.	Pronunciation.	English.
Ambassade	Anh!-ha-sad	*Embassy.*
Ambre	Anh!br'	*Amber.*
Chambre	Shanh!br'	*Chamber.*

AN.

French.	Pronunciation.	English.
Ancêtres	Anh!-saytr'	*Ancestors.*
Cantique	Kanh!-teck	*Song.*
Sans	Sanh!	*Without.*
Quand	Kanh!	*When.*

AIM, AIN and EIN have each the Nasal sound of AN, represented by ANH! The reason will be obvious, if we but dissect these combinations, which we now proceed to do, viz.:—

In the *first*—AIM,—AI is equivalent in sound to A only; hence, substituting A for AI in the combination AIM, we have simply AM, whose sound has been explained.

In the *second*—AIN, its sound is represented by ANH!, for the same reason.

In the *third*—EIN, EI is equivalent only to A in sound; hence, substituting A in the place of EI in the combination EIN, we have AN, whose sound is represented by ANH!

Again—EAN and OAN have each the Nasal sound represented by the letters ANH!

AEN in the Proper Name CAEN, have also the sound of AN, represented by the letters ANH!; hence the word CAEN is pronounced KANH!

EM.

French.	Pronunciation.	English.
Emblème	Anh!-hlaim	*Emblem.*
Emploi	Anh!ploah or pl'wah	*Employment.*
Esempla	Eg-zanh!pl'	*Pattern.*
Membrane	Manh!-bran	*Membrane.*
Temps or Tems	Tanh!	*Time.*

EN.

French.	Pronunciation.	English.
Bien	Beeanh! (one syll.)	*Well.*
Cependant	S'panh!-danh!	*Meanwhile.*
Enchanter	Anh!-shanh!-tay	*To charm.*
Encore	Anh!-kor	*Again.*
Moment	Mo-manh!	*Moment.*
Rendezvous	Ranh!-day-voo	*Appointed place.*
Sentiment	Sanh!-te-manh!	*Sensation.*
Surprendre	Sur-pranh!dr'	*To surprise.*

There are a few exceptions to the preceding illustrated pronunciation, which will be given, viz.:—

ENNUI:—according to the rule II, on a preceding page, the first EN of this word would not be Nasal, because the N is doubled. In this word, however, EN is a Nasal.

Ennui	Anh!-nnee	*Tediousness.*

In the following words, the EN, is a Nasal, viz.:—

Ennuyant	Anh!-nuee-eeanh!	*Annoying.*
Ennuyeusement	Anh!-nuee-eenh!z-manh!	*Tediously.*
Ennuyen	Anh!-nnee-eeuh!	*Tedious.*
Ennuyaux	Anh!-nuee-eeuh!	,,
Ennuyeuse	Anh!-nuee-eeuh!z	,,

In the word ENNUYER, the EN is Nasal,—the same is true of all derivatives from that word.

Ennuyer	Anh!-nuee-eay	*To annoy.*

There are some exceptions also to the pronunciation illustrated under the Nasal EM, on a previous page, in the following words, in which the M is doubled; but the Nasality *is not destroyed*, viz.:—

French.	Pronunciation.	English.
Emmagasinage	Anh!-ma-ga-zee-nazh	*Warehousing.*
Emmagasiner	Anh!-ma-ga-zee-nay	*To warehouse.*
Emmaigrir	Anh!-may-greer	*To grow lean.*
Emmaillottement	Anh!-mah-eegl-ot-manh!	*Swaddling.*
Emmaillotter	Anh!-mah-eegl-yo-tay	*To swaddle.*
Emmanchemrnt	Anh!-manh!sh-manh!	*Putting on a handle.*
Emmancher	Anh!-manh!-shay	*To put a handle to.*
Emmancher	Anh!-manh!-shay (Naval term)	*To enter a channel.*
Emmancheur	Anh!-manh!-sheuh!r	*Handle-maker.*
Emmanchure	Anh!-manh!-shure	*Arm-hole.*
Emmannequiner	Anh!-man-kee-nay	*To put into a basket.*
Emmanteló	Anh!-manh!t'-lay	*Hooded.*
Emmariné	Anh!-ma-re-nay	*Sea-hardened.*
Emmariner	Anh!-ma-re-nay	*To man a ship.*
Emmêler	Anh!-may-lay (Second syl. long)	*To entangle.*
Emménagemrnt	Anh!-may-nazh-manh!	*Furnishing a house.*
Emménagements	Anh!-may-nash-manh!s	*Ship's conveniences.*
Emménager	Anh!-may-na-zhay	*To furnish a house.*
Emménagogue	Anh!-may-na-gog	*Emmenagogue.*
Emmener	Anh!-m'nay	*To take away.*
Emménologie	Anh!-may-nol-o-zhee	* * * *
Emmenotter	Anh!-m'no-tay	*To handcuff.*
Emmiellé	Anh!-mea-lay	*Sweetened with honey*
Emmieller	Anh!-mea-lay	*To sweeten with honey.*
Emmitoufler	Anh!-mea-too-flay	*To wrap up.*
Emmitrer	Anh!-mee-tray	*To consecrate a bishop.*
Emmortaiser	Anh!-mor-tay-zay	*To mortise.*
Emmotté	Anh!-mo-tay	*Banked with earth.*
Emmuseler	Anh!-mus'-lay	*To muzzle.*

It is believed the above list comprises nearly every word in the French language which departs from the general rule of Nasals in EM.

The following words are exceptions to the *first* General Rule concerning Nasals, on a previous page, viz.:—

French.	Pronunciation.	English.
Enivrant	Anh!-nee-vranh!	*Intoxicating.*
Enivrement	Anh!-neevr'-manh!	*Intoxication.*
Enivrer (and all derived from it)	Anh!-nee-vray	*To intoxicate.*
Enorgueillir ,,	Anh!-or-guaygl-yeer	*To render proud.*

IM.

French.	Pronunciation.	English.
Imbécile	Anh!-bay-sil	*Foolish.*
Impénitence	Anh!-pay-ne-tanh!s	*Impenitence.*
Impératoire	Anh!-pay-ra-toahr or t'wahr	*Master-wort.*
Impossible	Anh!-po-sibl'	*Impossible.*
Limbe	Lanh!b	*Limb.*
Limpide	Lanh!-pid	*Limpid.*

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IN.

French.	Pronunciation.	English.
Cinq	Sanh!k	*Five.*
Chemin	Sh'manh!	*Road.*
Fin	Fanh!	*End.*
Ingratitude	Anh !-gra-te-tude	*Ingratitude.*
Instant	Anh !-stanh!	*Instant.*
Médecin	Mayd'-sanh!	*Physician.*
Vin	Vanh!	*Wine.*

OM.

French.	Pronunciation.	English.
Bombance	Bonh!-banh!s	*Good living.*
Bombe	Bonh!b	*Shell.*
Comble	Konh!bl'	*Consummation.*
Lombard	Lonbl-bar	*Lombard.*
Nombre	Nonh!br'	*Number.*
Plomb	Plonh!	*Lead* (a metal).
Trompette	Trouh!-pait	*Trumpet.*

ON.

French.	Pronunciation.	English.
Bon	Bonh!	*Good.*
Canton	Kanh!-tonh!	*Canton.*
Dindon	Danh!-donh!	*Turkey-cock.*
Donc	Donh!	*Then.*
Long-temps	Lonh!-tanh!	*A great while.*
Maison	May-zonh!	*House.*
Mon	Monh!	*Mine.*
Nom	Nonh!	*Name.*
Raison	Ray-zonh!	*Reason.*
Répondit	Ray-ponh!-dee	*Replied.*

The French word MONSIEUR is pronounced by foreigners all sorts of ways, *except the right way*, in common conversation. The author knows of no one French word so much in use by those who speak the English language, as this; and yet pronounced so variously and incorrectly. Let us analyse this word, and, if possible, set forth its correct sound.

Remember, then, that the N and R of the word MONSIEUR are always *silent*;—the N is silent by the Rule of custom, and the R is silent according to the General Rule which obtains concerning *final Consonants*.

Take out of the word the letters N and R, and we have MOSIEU. Divide it now into syllables, and we have MO and SIEU. In the first syllable, the O is short like the letter O in the English word NOT,—therefore the pronunciation of the first syllable MO, is easily ascertained. But in the second and last syllable SIEU, we have a Diphthong of THREE SUCCESSIVE VOWELS, viz.: IEU divided thus, I-EU, but pronounced as one syllable, preserving the sounds of both divisions. The sound of I is short, like I in the English word FIG;—and the sound of EU is exactly like E Mute or unaccented.

These are the elements of the different sounds in the French word MONSIEUR, and are thus pronounced, viz.:—MO-SIEU or MO-SIUH!

Sometimes it is pronounced MOS-SIEU, but incorrectly, because the Parisian critic and scholar gives it but one S, and that, *at the beginning of the second syllable.*

Hence it will be perceived, that it is simply ridiculous to pronounce this word *Mong-seer* or *Mon-seeuh*. The ON in this word is not a Nasal, because the N is silent. The I is not long, and cannot be illustrated by EE, but is short, as above explained.

UM.

French.	Pronunciation.	English.
Humblement	Unh!-bl'-manh!	*Humbly.*
Parfum	Par-funh!	*Perfume.*

The following are exceptions to the above illustrated pronunciation, viz.:—

French.	Pronunciation.	English.
Lumbago	Lonh!-ha-go	*Lumbago.*
Rum, Rhum and Rumb	Ronh!	*Rum.*
Umble	Onh!bl'	*Umber.*

UN.

French.	Pronunciation.	English.
Aucun	O-kunh!	*Any.*
Chacun	Sha-kunh! (first syll. short)	*Each.*
Commun	Ko-munh!	*Common.*
Un	Unh!	*One.*

The following are exceptions to the above illustrated pronunciation, viz.:—

Nuncupatif	Nonh!-ku-pah-tcef	*Nuncupative.*
Nundinal	Nonh!-de-nal	*Nundinal.*

YM and YN are now very seldom found in the French language; they are, however, pronounced like IM and IN, which have been already illustrated. Other illustrations of Nasal Vowel sounds will be given in future lessons.

71. Nasal Diphthongal Sounds.

There are Seven Nasal Diphthongal Combinations; and they are thus divided and pronounced, viz.:—

ian	divided into	l-an	and pronounced	eanh!
ien	"	i-en	"	eanh!
ion	"	l-on	"	eonh!
uan	"	u-an	"	uanh! or wanh!
uin	"	u-in	"	uanh! or wanh!
ouan	"	ou-an	"	ooanh! or wanh
ouin	"	ou-in	"	ooanh! or wanh!

Further illustrations of the pronunciation of these Nasal Diphthongal sounds will be given in future lessons.

LESSONS IN ALGEBRA.—No. XXV.

(*Continued from page* 107.)

METHOD FOR COMPLETING THE SQUARE.—*Continued.*

Before completing the square, the known and unknown quantities must be brought on opposite sides of the equation by transposition; the square of the unknown quantity must also be *positive*, and it is preferable to make it the *first* or *leading* term.

12. Reduce the equation $a+5x-3b=3x-x^2$

Transp. and uniting terms $x^2+2x=3b-a$

Completing the square $x^2+2x+1=1+3b-a$

And $x=-1\pm\sqrt{1+3b-a}$. Ans.

13. Reduce the equation $\frac{x}{2}=\frac{36}{x+2}-4.$

If the *highest power* of the unknown quantity has a *co-efficient*, or *divisor*, *before* completing the square it must be freed from these by multiplication or division.

14. Reduce the equation $x^2+24a-6h=12x-5x^2$

Transp. and uniting terms $6x^2-12x=6h-24a$

Dividing by 6 $x^2-2x=h-4a$

Completing the square $x^2-2x+1=1+h-4a$

Extracting and transp. $x=1\pm\sqrt{1+h-4a}$. Ans

15. Reduce the equation $h+2x=d-\frac{bx^2}{a}.$

If the square of the unknown quantity is in *several terms*, the equation must be divided by *all* the co-efficients of this square.

16. Reduce the equation $bx^2+dx^2-4x=b-h$

Dividing by $b+d$, $x^2-\frac{4x}{b+d}=\frac{b-h}{b+d}.$

17. Reduce the equation $ax^2+x=h+3x-x^2$

Given $ax^2+bx=d$, to find x.

If this equation is multiplied by $4a$, and if b^2 is added to both sides, it will become,

$$4a^2x^2+4abx+b^2=4ad+b^2;$$

the first member of which is a complete square of the binomial $2ax + b$.

From the foregoing principle is deduced

A SECOND METHOD OF COMPLETING THE SQUARE.

Multiply the equation by 4 times the co-efficient of the highest power of the unknown quantity, and add to both sides the square of the co-efficient of the lowest power.

The advantage of this method is, that it avoids the introduction of *fractions* in completing the square.

DEMONSTRATION.

1. The object of multiplying the equation by the *co-efficient* of the *highest power*, is to render the first term a perfect square without removing its co-efficient, and at the same time to obtain the middle term of the square of a binomial. But we must multiply all the terms of the equation by this quantity to preserve the equality of its members. The equation above, when multiplied by a, becomes $a^2x^2 + abx = ad$.

That the first term will, in all cases, be rendered a complete square when multiplied by its co-efficient, is evident from the fact, that it will then consist of two factors, each of which is a square, viz. x^2, and the square of its co-efficient. But the product of the squares of two or more factors is equal to the square of their product.

2. It will be seen that one term is still wanting in the first member, in order to make it the square of a binomial, viz. the square of the last term.

This deficiency may be supplied by adding to both sides the square of half the co-efficient of the lowest power, as in the first method of completing the square. But in taking half of this co-efficient, the learner will often be encumbered with fractions which it is desirable to avoid. Thus in the equation above, half of the co-efficient of the lowest power is $\frac{b}{2}$, the square of which is $\frac{b^2}{4}$. Adding this to both sides, the equation will become $a^2x^2 + abx + \frac{b^2}{4} = ad + \frac{b^2}{4}$, the first member of which is a complete square of the binomial, $ax + \frac{b}{2}$.

Now it is obvious that multiplying the equation by 4 is the same as removing the denominator 4 from the third term. Hence multiplying the equation by 4 will avoid the introduction of fractions, and also leave the square of the whole of the co-efficient of the lowest power to be added to both sides according to the rule.

The first term evidently continues to be a square after it is multiplied by 4, for it is still the product of the *powers* of certain factors.

3. It will be perceived at once, that the second term is composed of twice the root of the first term multiplied into the co-efficient of the last term, which constitutes the middle term of a binomial square.

Obs.—It is manifest from the preceding demonstration, that multiplying by 4 is not a *necessary* step in completing the square, but is resorted to as an expedient to prevent the occurrence of fractions. When, therefore, the co-efficient of the lowest power is an *even* number, so that half of it can be taken without a remainder, we may *simplify* the operation by multiplying by the co-efficient of the highest power alone, and adding to both sides the square of half the co-efficient of the lowest power of the unknown quantity.

Take the equation	$7x^2 + 40x = 71\frac{3}{4}$.
Multiplying by 7 it becomes	$49x^2 + 280x = 500$
Adding the square of $\frac{1}{2}$ the co-efficient	$49x^2 + 280x + 400 = 900$
By evolution and transposition	$x = 10$.

From the preceding principles we may also deduce

OTHER METHODS OF COMPLETING THE SQUARE.

Multiply the equation by 16 times the co-efficient of the highest power of the unknown quantity, and add to both sides 4 times the square of the co-efficient of the lowest power.

And universally, multiplying the equation by the product of any square number, as n^2, into the co-efficient of the highest power, and adding to both sides the square of half the root of this number into the square of the co-efficient of the lowest power, will render it a complete square.

Take the equation	$x^2 - 3x = 4$.
Multiplying by 16, etc.	$16x^2 - 48x + 36 = 100$
By evolution and transposition	$x = 4$. Ans.
Or, take the equation	$ax^2 + cx = d$.

Mult. by n^2, etc. $n^2a^2x^2 + n^2acx + \frac{n^2c^2}{4} = n^2ad + \frac{n^2c^2}{4}$;

the first member of which is the square of the binomial, $nax + \frac{nc}{2}$.

There is an *obvious advantage*, however, in employing 4 in preference to any other square number. For multiplying the equation by 4 times the co-efficient of the highest power, will produce the *middle* term of a binomial square, the *third* term of which is the square of the co-efficient of the lowest power

18. Reduce the equation $ax^2 + dx = h$.
19. Reduce the equation $3x^2 + 5x = 42$.
20. Reduce the equation $x^2 - 15x = -54$.

In the square of a binomial, the first and last terms are always *positive*. For each is the square of one of the terms of the root, and all even powers are positive.

If then $-x^2$ *occurs in an equation, it cannot with this sign form a part of the square of a binomial.* But if *all* the signs in the equation be changed, whilst the equality of the sides will be preserved, the term $-x^2$ will become positive, and the square may then be completed.

21. Reduce the equation	$-x^2 + 2x = d - h$.
Changing all the signs	$x^2 - 2x = h - d$.
22. Reduce the equation	$4x - x^2 = -32$.

In a quadratic equation the first term x^2 is the square of a single letter. But a binomial quantity may consist of terms, one or both of which are already powers.

Thus $x^3 + a$ is a binomial, and its square is $x^6 + 2ax^3 + a^2$, where the index of x in the first term is twice as great as in the second. When the third term is deficient, the square may be completed in the same manner as that of any other binomial. For the middle term is twice the product of the roots of the two others.

So the square of $x^{\frac{1}{2}} + a$, is $x^{\frac{2}{2}} + 2ax^{\frac{1}{2}} + a^2$.

And the square of $x^{\frac{1}{n}} + a$, is $x^{\frac{2}{n}} + 2ax^{\frac{1}{n}} + a^2$. Therefore

Any equation which contains only two different powers or roots of the unknown quantity, the index of one of which is twice that of the other, may be solved in the same manner as a quadratic equation, by completing the square.

N.B. It must be observed, that in the binomial root, the letter expressing the unknown quantity may still have a fractional or integral index, so that a further operation may be necessary.

23. Reduce the equation	$x^{\frac{1}{2}} - x^{\frac{1}{4}} = b - a$.
Completing the square	$x^{\frac{1}{2}} - x^{\frac{1}{4}} + \frac{1}{4} = \frac{1}{4} + b - a$
Extracting and transposing	$x^{\frac{1}{4}} = \frac{1}{2} \pm \sqrt{\frac{1}{4} + b - a}$
Extracting again	$x = \pm\sqrt{\frac{1}{2} \pm \sqrt{(\frac{1}{4} + b - a)}}$.
24. Reduce the equation	$x^{2n} - 4bx^n = a$.
25. Reduce the equation	$x + 4\sqrt{x} = b - n$.
26. Reduce the equation	$x^{\frac{2}{n}} + 8x^{\frac{1}{n}} = c + b$.

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The solution of a quadratic equation, whether pure or affected, gives two results. For after the equation is reduced, it contains an ambiguous root. In a *pure* quadratic, this root is the *whole* value of the unknown quantity.

Thus the equation $x^2 = 64$,

Becomes, when reduced, $x = \pm\sqrt{64}$.

That is, the value of x is either $+8$ or -8, for each of these is a root of 64. Here both the values of x are the same, except that they have contrary signs. This will be the case in every pure quadratic equation, because the whole of the second member is under the radical sign. The two values of the unknown quantity will be alike, except that one will be positive, and the other negative.

But in *affected* quadratics, a *part* only of one side of the reduced equation is under the radical sign. When this part is added to, or subtracted from, that which is without the radical sign; the two results will differ in quantity, and will have their signs in some cases alike, and in others unlike.

27. The equation $x^2 + 8x = 20$

Becomes, when reduced, $x = -4 \pm \sqrt{16 + 20}$.

That is $x = -4 \pm 6$.

Here the first value of x is $-4+6 = +2$ } one positive, and

And the second is $-4-6 = -10$ } the other negative.

28. The equation $x^2 - 8x = -15$

Becomes, when reduced, $x = 4 \pm \sqrt{16 - 15}$

That is, $x = 4 \pm 1$.

Here the first value of x is $4+1 = +5$ } both positive.

And the second is $4-1 = +3$ }

That these two values of x are correctly found, may be proved by substituting first one and then the other, for x itself, in the original equation.

Thus $5^2 - 8 \times 5 = 25 - 40 = -15$

And $3^2 - 8 \times 3 = 9 - 24 = -15$.

In the reduction of an affected quadratic equation, the value of the unknown quantity is frequently found to be *imaginary*.

29. Thus the equation $x^2 - 8x = -20$

Becomes, when reduced, $x = 4 \pm \sqrt{10 - 20}$

That is $x = 4 \pm \sqrt{-4}$.

Here the root of the negative quantity -4 cannot be assigned, and therefore the value of x cannot be found. There will be the same impossibility in every instance in which the negative part of the quantities under the radical sign is greater than the positive part.

When *one* of the values of the unknown quantity in a quadratic equation is imaginary, the *other* is so also. For both are equally affected by the imaginary root.

Thus in the example above,

The first value of x is $4 + \sqrt{-4}$,

And the second is $4 - \sqrt{-4}$; each of which

contains the imaginary quantity $\sqrt{-4}$.

An equation which, when reduced, contains an imaginary root, is often of use to enable us to determine whether a proposed question admits of an answer, or involves an absurdity.

30. Suppose it is required to divide 8 into two such parts that the product will be 20.

If x is one of the parts, the other will be $8 - x$.

By the conditions proposed $(8 - x) \times x = 20$

This becomes, when reduced, $x = 4 \pm \sqrt{-4}$.

Here the imaginary expression $\sqrt{-4}$ shows that an answer is impossible; and that there is an absurdity in supposing that 8 may be divided into two such parts that their product shall be 20.

Although a quadratic equation gives two results, yet both these may not always be applicable to the subject proposed. The quantity under the radical sign may be produced either from a positive or a negative root. But both these roots may not, in every instance, belong to the problem to be solved.

31. Divide the number 30 into two such parts that their product may be equal to 8 times their difference.

If $x =$ the less, then $30 - x =$ the greater part.

By the supposition, $x \times (30 - x) = 8 \times (30 - 2x)$.

This reduced, gives $x = 23 \pm 17 = 40$, or 0, the less part

But as 40 cannot be a part of 30, the problem can have but one real solution, making the less part 6, and the greater part 24.

The preceding principles in quadratic equations may be summed up in the following

GENERAL RULE.

I. *Transpose all the unknown quantities to one side of the equation; and the known quantities to the other.*

II. *Make the square of the unknown quantity positive* (if it is not already) *by changing the signs of all the terms on both sides; and place it for the first or leading term.*

III. To complete the square,

1. *Remove the co-efficient of the second power of the unknown quantity, and add the square of half of the co-efficient of the first power of the unknown quantity to both sides of the equation.*

2. *Or multiply the equation by four times the co-efficient of the highest power of the unknown quantity, and add to both sides the square of the co-efficient of the first power of the unknown quantity.*

IV. *Reduce the equation by extracting the square root of both sides; and transpose the known part of the binomial root term obtained to the opposite side.*

EXAMPLES FOR PRACTICE.

1. Reduce $3x^2 - 9x - 4 = 80$.

2. Reduce $4x - \frac{36 - x}{x} = 46$.

3. Reduce $4x - \frac{14 - x}{x + 1} = 14$.

4. Reduce $6x - \frac{3x - 3}{x - 3} = 2x + \frac{3x - 6}{2}$.

5. Reduce $\frac{16}{x} - \frac{100 - 9x}{4x^2} = 3$.

6. Reduce $\frac{3x - 4}{x - 4} + 1 = 10 - \frac{x - 2}{2}$.

7. Reduce $\frac{x + 4}{3} - \frac{7 - x}{x - 3} = \frac{4x + 7}{9} - 1$.

8. Reduce $\frac{x^3 - 10x^2 + 1}{x^2 - 6x + 9} = x - 3$.

9. Reduce $\frac{0}{x + 1} + \frac{2}{x} = 3$.

10. Reduce $\frac{3x}{x + 2} - \frac{x - 1}{6} = x - 9$.

11. Reduce $\frac{x}{a} + \frac{a}{x} = \frac{2}{a}$.

12. Reduce $x^4 + ax^2 = b$.

13. Reduce $\frac{x^2}{2} - \frac{x^3}{4} = -\frac{1}{8}$.

14. Reduce $2x^{\frac{2}{3}} + 3x^{\frac{1}{3}} = 2$.

15. Reduce $\frac{1}{2}x - \frac{1}{3}\sqrt{x} = 22\frac{1}{2}$.

16. Reduce $2x^3 - x^2 + 96 = 99$.

17. Reduce $(10 + x)^{\frac{1}{2}} - (10 + x)^{-\frac{1}{2}} = 2$.

18. Reduce $3x^{2n} - 2x^n = 8$.

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19. Reduce $2(1+x-x^2)-\sqrt{1+x-x^2}=-\frac{1}{2}$.

20. Reduce $\sqrt[3]{x^3-a^3}=x-b$.

21. Reduce $\frac{\sqrt{4x}+2}{4+\sqrt{x}}=\frac{4-\sqrt{x}}{\sqrt{x}}$.

22. Reduce $x^{\frac{2}{3}}+x^{\frac{1}{3}}=756$.

23. Reduce $\sqrt{2x+1}+2\sqrt{x}=\frac{21}{\sqrt{(2x+1)}}$.

24. Reduce $2\sqrt{x-a}+3\sqrt{2x}=\frac{7a+5x}{\sqrt{(x-a)}}$.

25. Reduce $x+16-7\sqrt{x+16}=10-4\sqrt{x+16}$.

26. Reduce $\sqrt{x^5}+\sqrt{x^3}=6\sqrt{x}$.

27. Reduce $\frac{4x-5}{x}-\frac{3x-7}{3x+7}=\frac{9x+23}{13x}$.

28. Reduce $\frac{3}{6x-x^2}+\frac{6}{x^2+2x}=\frac{11}{5x}$.

29. Reduce $(x-5)^3-3(x-5)^{\frac{2}{3}}=40$.

30. Reduce $x+\sqrt{x+6}=2+3\sqrt{x+6}$.

LESSONS IN ITALIAN GRAMMAR.—No. XXXIX.

Secondly.—Verbs ending in *dere*.

Ardere, to burn.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *ardere*, to burn	Past: *avére árso*, to have burnt
Present Gerund: *ardéndo*, burning	Past Gerund: *avéndo árso*, having burnt
Past Participle: *árso*, burnt	

INDICATIVE MOOD.

Present.

A'rdo, I burn
árdi, thou burnest
árde, he burns
ardiámo, we burn
ardéte, you burn
árdono, they burn

Imperfect.

Ardéa or *ardéa*, I was burning
ardévi, thou wast burning
ardéva or *ardéa*, he was burning
ardevámo, we were burning
ardevéte, you were burning
ardévano or *ardéano*, they were burning

Indeterminate Preterite.

A'rsi, I burnt
ardésti, thou burntest
árse or *ardéo*, he burnt
ardémmo, we burnt
ardéste, you burnt
ársero, they burnt

Future.

Arderò, I shall or will burn
arderái, thou wilt burn
arderá, he will burn
arderémo, we will burn
arderéte, you will burn
arderánno, they will burn

Conditional Present.

Arderéi or *ardería*, I should or would burn
arderésti, thou wouldst burn
arderébbe or *ardería*, he would burn
arderémmo, we would burn
arderéste, you would burn
arderébbero or *arderíano*, they would burn

IMPERATIVE MOOD.

[No First Person.]
A'rdi, burn (thou)
árdo, let him burn
ardiámo, let us burn
ardéte, burn (ye or you)
árdano, let them burn

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che árda, that I may burn	*Che ardéssi*, that I might burn
che árde or *árdi*, that thou mayst burn	*che arséssi*, that thou mightst burn
che árda, that he may burn	*che ardésse*, that he might burn
che ardiámo, that we may burn	*che ardéssimo*, that we might burn
che ardiáte, that you may burn	*che ardéste*, that you might burn
che árdano, that they may burn	*che ardéssero*, that they might burn

So conjugate—

Infinitive.	Indet. Pret.	Past Part.	ENGLISH.
Acchiúdere,	*acchiúsi*,	*acchiúso*,	to inclose
Alliúdere,	*alliúsi*,	*alliúso*,	alludo
Ancidere,	*ancísi*,	*anciso*,	kill
Applaudere,	*applaúsi*,	*applaúso*,	applaud
Arridere,	*arrísi*,	*arríso*,	favour
Assidere,	*assízi*,	*assíso*,	besiege
Chiédere,	*chiési*,	*chiésto*,	ask
Chiúdere,	*chiúsi*,	*chiúso*,	shut up
Collidere,	*collísi*,	*collíso*,	beat
Concédere,	*concéssi*,	*concésso*,	grant
Conchiúdere,	*conchiúsi*,	*conchiúso*,	conclude
Conquidere,	*conquísi*,	*conquíso*,	vex
Corródere,	*corrósi*,	*corróso*,	corrode
Decidere,	*decísi*,	*decíso*,	decide
Delúdere,	*delúsi*,	*delúso*,	deceive
Deridere,	*derísi*,	*deríso*,	mock
Dischiédere,	*dischiési*,	*dischiésto*,	not to ask
Dischiúdere,	*dischiúsi*,	*dischiúso*,	to disclose
Dividere,	*divísi*,	*díviso*,	divide
Elidere,	*elísi*,	*elíso*,	retrench
Elúdere,	*elúsi*,	*elúso*,	elude
Escludere,	*esclúsi*,	*esclúso*,	exclude
Estrúdere,	*estrúsi*,	*estrúso*,	chase
Illúdere,	*illúsi*,	*illúso*,	mock
Incidere,	*incísi*,	*inciso*,	cut
Inchiédere,	*inchiési*,	*inchiésto*,	search
Inchiúdere,	*inchiúsi*,	*inchiúso*,	include
Includere,	*inclúsi*,	*inclúso*,	include
Intercidere,	*intercísi*,	*intercíso*,	cut
Intridere,	*intrísi*,	*intríso*,	temper
Intrúdere,	*intrúsi*,	*intrúso*,	intrude
Invadere,	*invási*,	*inváso*,	invade
Mórdere,	*mórsi*,	*mórso*,	bite
Precidere,	*precísi*,	*preciso*,	shorten
Precludere,	*preclúsi*,	*preclúso*,	hinder
Pérdere,	*pérsi*,	*pérso*,	lose
Racchiúdere,	*racchiúsi*,	*racchiúso*,	inclose
Rádere,	*rási*,	*ráso*,	shear
Ridere,	*rísi*,	*ríso*,	laugh
Richiédere,	*richiési*,	*richiésto*,	ask again
Ródere,	*rósi*,	*róso*,	gnaw
Schiúdere,	*schiúsi*,	*schiúso*,	open [ty
Sconclúdere,	*sconclúsi*,	*sconclúso*,	breaka tren-
Sorridere,	*sorrísi*,	*sorríso*,	smile
Sottodividere,	*sottodivísi*,	*sottodíviso*,	subdivide
Spérdere,	*spérsi*,	*spérso*,	dissipate
Strapérdere,	*strapérsi*,	*strapérso*,	lose much
Succédere,	*succési*,	*succéso*,	succeed
Uccidere,	*uccísi*,	*uccíso*,	kill.

2.

Verbs ending in *ndere*.

Rispóndere, to answer.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *rispóndere*, to answer	Past: *avére rispósto*, to have answered
Present Gerund: *rispondéndo*, answering	Past Gerund: *avéndo rispósto*, having answered
Past Participle: *rispósto*, answered	

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Indicative Mood.

Present.

Rispóndo, I answer
rispóndi, thou answerest
risponde, he answers
rispondiámo, we answer
rispondéte, you answer
rispóndono, they answer

Imperfect.

Rispondéva, I was answering
rispondévi, thou wast answering
rispondéva, he was answering
rispondevámo, we were answering
rispondevéte, you were answering
rispondé-vano, they were answering

Indeterminate Pretetite.

Rispósi, I answered
rispondésti, thou answeredst
rispóse, he answesed
rispondémmo, wa answered
rispondéste, you answered
rispósero, they answered

Future.

Risponderò, I shall or will answer
risponderái, thou wilt answer
risponderà, he will answer
risponderémo, wa will answer
responderéte, you will answer
risponderánno, they will answer

Conditional Present.

Risponderéi, I should or would answer
risponderésti, thou wouldst answer
risponderébbe, he would answer
risponderémmo, we would answer
risponderéste, you would answer
risponderébbero, they would answer

Imperative Mood.

[No First Person.]
Rispóndi, answer (thou)
rispónda, let him answer
rispondiámo, let us answer
rispondéte, answer (ye or you)
rispóndano, let them answer

Subjunctive Mood.

Present.

Che rispónda, that I may answer
che rispónda, that thou mayst answer
che rispónda, that he may answer
che rispondiámo, that we may answer
che rispondiáte, that you may answer
che rispóndano, that they may answer

Imperfect.

Che rispondéssi, that I might answer
che rispondéssi, that thou mightst answer
che rispondésse, that he might answer
che rispondéssimo, that we might answer
che rispondéste, that you might answer
che rispondéssero, that they might answer

So conjugate—

Infinitive.	Indet. Pret.	Past Part.	English.
Accéndere,	*accési*,	*accéso*,	to light
Appéndere,	*oppési*,	*oppéso*,	hang
Arrèndere,	*arrési*,	*orréso*,	surrender
Ascéndere,	*ascési*,	*oscéso*,	go up
Ascóndere,	*oscési*,	*ascóso* or —*sto*,	hide
Atténdere,	*ottési*,	*attéso*,	ottend
Confóndere,	*confusi*,	*confuso*,	confound
Conténdere,	*contési*,	*contéso*,	dispute
Difèndere,	*difési*,	*difeso*,	defend
Dipéndere,	*dipési*,	*dipéso* or *dipendúto*,	depend
Discéndere,	*discési*,	*discéso*, [*dísto*,	descend
Disténdere,	*distési*,	*distéso*,	stretch
Fóndere,	*fusi*,	*fuso* or *fondúto*,	melt,
Impéndere,	*impési*,	*impéso* or *impendúto*,	hang on
Inténdere,	*intési*,	*intéso*, [*dúto*,	hear
Nascóndere,	*nascósi*,	*nascóso* or —*sto*,	conceal
Offéndere,	*offési*,	*offeso*,	offend
Prèndere,	*préso*,	*préso*,	take
Pretèndere,	*pretési*,	*pretéso*,	pretend
Réndere,	*rési*,	*réso* or *rendúto*,	render
Scéndere,	*scési*,	*scéso*,	come down
Scíndere,	*scisi* or *scinsi*,	*scísto*,	separate
Sorprèndere,	*sorpresi*,	*sorpréso*,	surprise
Sospéndere,	*sospési*,	*sospéso*,	suspend
Spándere,	*spansi*,	*spánso* or *spanto*,	scatter
Spéndere,	*spesi*,	*spéso*,	spend
Tendere,	*tesi*,	*téso*,	stretch
Tondere,	*tósi*,	*tondúto*,	shear

Vocabulary.

Stare, to stand
certo, certain, certainly
cavalière, a knight, gentleman
ammirare, to admire
vivacità, vivacity
prontezza, promptitude
pure, however
compire, to finish, complete
ancóra, yat
anno, a yaar
nono, ninth
età, ago
vecchio, old
presenza, presence
questo, this
principíno, a young prince
quando, when
fanciúllo, a child
ténero,—*a*, tender
loro, their
tanto, so much, so great
ingégno, genius, natural ability
diventare, to become
poi, then
matúro,—*a*, mature
stúpido, stupid
allóra, then
ciò, that
vero,—*a*, true
bisognáre, to be necessary
bisogna ch' abbiáte, you must have
fanciullézza, childhood
eccellente, excellent
dovére, to be obliged, owe, have to
rè, a king
due,—*e*, two
ora, an hour
doppo, after
mezzo, middle, mid
dì, a day
entrare, to enter
mandare, to send
senato, the senate
deputáto, a deputy
per, for, in order to
compliménto, a compliment
colúi, he, that
toccare, to toueh, concern
al quale toccáva, whose duty it was
complire, to compliment
magno, great
grande, great
súbito, sudden, suddenly
ammutire, to be dumb
senza, without
più, more
proferire, to utter
alcúno, any
paróla, word
notáre, to observe
giorno, a day
mangiáre, to eat
sì, yes
pranzáre, to dine
digiúno, hungry
verso, towards
palazzo, a palace
dove, where
apparecchiáre, to prepare
sontuóso, sumptuous
pranzo, a dinner
pittóre, a painter
mostráre, to show
cattivo, wratched, bad
quadro, a picture
grido, renown
pregiársi, to boast, pique one's self
pocho, little
tempo, time
sentire, to perceiva
piacevolménte, pleasantly, with a smile
occórrere, to happen, to be necessary
che, because
medésimo, itself
bastánza, sufficiency, abundance

Exercises.

Stando certi cavaliéri ammirándo la vivacita e prontézza d' ingégno di Pico di Mirándola, che pure non avéva compito ancóra l' anno nono dell' età sua: un vecchio goffo venne à dire in presénza di questo principíno: Quando li fanciúlli nella ténera atà loro hanno tanto ingégno, divéntano poi nell' età matúra stúpidi a goffi. Allóra disse Pico, Se ciò che dite o vero; bisógna certo ch' abbiáte avúto nella vostra fanciullézza un' eccellentissimo * ingégno.

Dovendo un rè a due ore doppo mezzo dì entrár in una città, gli fúrono mandáti dal senáto certi deputáti per fargli compliméuto. Colúi al quale toccáva di compíre, disse, Alessándro Magno, il Grand' Alessándro; a súbito s' ammutì senza potér più proferír alcúna paróla; il che avéndo notáto il rè, chi in quel giorno non avéva ancóra mangiáto, gli disse: Sì amico, Alessándro Magno avéva pranzáto, a lo son ancor digiúno: o ciò detto sen' † andò verso il palázzo dal senáto dove gli era stato apparecchiáto un sontuosissimo pranzo.

Un pittóre mostrándo un cattívo quadro in presénza di molti pittóri di gran grido, si pregiáva d' avérlo finito in pochissimo tempo, il che sentándo Apélle, gli disse piacevolméuta: Non occórre che tu ci dica d' avérlo finito in poco tempo, cha 'l quadro medésimo lo dice à bastanza da per se.

* The superlative of *eccolente*, formed, according to the ordinary rule, by adding *issimo* to the last consonant of the positive.
† For *se ne*

LESSONS IN SPANISH.—No. V.

POSSESSIVE PRONOUNS.

The possessive pronouns are *mio*, my; *tuyo*, thy; *suyo*, his, her, its, or their; *nuestro*, our; *vuestro*, your. They are declined in the following paradigm:

Singular.		*Plural.*	
Masc.	Fem.	Masc.	Fem.
Mio	*mia*	*Mios*	*mias*
Tuyo	*tuya*	*Tuyos*	*tuyas*
Suyo	*suya*	*Suyos*	*suyas*
Nuestro	*nuestra*	*Nuestros*	*nuestras*
Vuestro	*vuestra*	*Vuestros*	*vuestras*

The possessive pronouns *mio*, *tuyo*, and *suyo*, with their feminines, drop their last syllable when they precede the noun to which they belong; as,

Mi padre, mi madre, my father, my mother.
Tu hijo, tu hija, thy son, thy daughter.
Su hermano, su hermana, his brother, his sister.
Mis tios, mis tias, my uncles, my aunts.
Sus caballos, his (her or their) horses.

If *mio*, *tuyo*, or *suyo* come after the noun to which they belong, the last syllable is retained; as,

¡ Padre mio! ¡ madre mia! my father! my mother!
Este libro es suyo, this book is his (or hers, or theirs).
Esta gallina es suya, this hen is his (or hers, or theirs).
Estos libros son suyos, these books are his (or hers, or theirs).

The possessive pronouns agree in gender and number with the object possessed, and not with the person or thing possessing. Thus, *su libro* may mean—his book, her book, or their book; *sus libros* may mean—his books, her books, or their books. If we are speaking of a woman, and wish to say, "this hen is hers," it would be in Spanish, *esta gallina es suya*; if we wish to say, "this horse is hers," it would be, *este caballo es suyo*; if we wish to say, "these houses are hers," it would be, *estas casas son suyas*; and "these oxen are hers," would be, *estos bueyes son suyos*. Instead of "hers," the possessive pronoun in each of these sentences, without any alteration, might be rendered "his," if we were speaking of a male person. This is a very important rule, and should be remembered, since it is so unlike the English rule for the agreement of possessive pronouns.

The context will generally show whether *suyo* should be rendered—his, her, or their: otherwise, to prevent ambiguity, *de él*, of him; *de ella*, of her; *de ellos*, of them (masc.), *de ellas*, of them (fem.), etc., are added; as,

Este libro es suyo de él, this book is his.
Este libro es suyo de ella, this book is hers.
Estos libros son suyos de vmd., these book are yours.
Estos libros son suyos de ellas, these books are theirs (fem.).

The absolute possessive pronouns, mine, thine, his own, her own, its own, ours, yours, theirs, are formed by placing the definite article before the possessive pronouns; thus, *el mio, la mia, los mios, las mias*, mine; *el nuestro, la nuestra, los nuestros, las nuestras*, ours; as,

Su hermano y el mio, his brother and mine.
Tu madre y la mia, thy mother and mine.
Vuestras hermanas y las mias, your sisters and mine.
Sus caballos y los nuestros, his (her or their) horses and ours.

If a verb which indicates possession come before the pronoun, the article is omitted; as,

Este hombre es sobrino mio y suyo de ella, this man is my nephew and hers.

When in English the preposition *of* comes before the absolute possessive pronoun, as in such phrases as, "a horse of ours," "a dog of mine," etc., the preposition is not used in Spanish; as,

Un hijo mio es capitan, A son of mine (or, one of my sons) is captain.

Instead of the personal pronouns, the definite article is used in Spanish when any member or part of the human body is described as being acted upon, or as being in a certain state, in such a manner as to make it evident that it refers to the person himself to whom the member or part belongs; as,

El la tomó por la mano, he took her by her (the) hand.
Ella levantó los ojos, she raised her (the) eyes.
El publicano hería el pecho, the publican was smiting his (the) breast.

If, however, any member or part of the human body, or parts of dress, be described as acting, or the object of an action, and the article alone would not leave it evident to whom such member or part belongs, then (instead of a possessive pronoun) a personal pronoun and the definite article are both used; as,

El le *tocó* la *mano*, he touched *the* hand *to-him*.
La mano le *tiembla*, *the* hand *to-him* trembles.
El te *tomó* las *botas*, he *to-thee* took *the* boots.

In these examples the learner will perceive that in English the possessive pronoun alone would have been used; thus, *he* touched *his* hand; *his* hand trembles; he took *thy* boots.

It has already been mentioned that in ordinary conversation *vmd.* (*usted*) and *vmds.* (*ustedes*) are used instead of the second person *tu* and *vosotros*; and that *vmd.* being of the third person, requires its possessive pronouns to be of the third person also, though rendered in English by the second person; as,

¿ Está vmd. *bueno? ¿ como va su salud?* are *you* well? how is *your* health?
¿ Está vmd. *buena? ¿ como va su salud?* are *you* well? how is *your* health?
Yo iba á su casa para hacerle una visita, I was going to *your* house to pay *you a* visit.

These examples, rendered into English literally, would be, "Is your worship well? how is his health?" "Is your (her) worship well? how is her health?" "I was going to his (or her) house to make him (or her) a visit."

To prevent ambiguity, *vmd.* or *vmds.* (your worship or your worships) is often used in addition to the possessive pronoun, or the definite article; as, *Yo le doy á vmd. muchas gracias*, I *to him* give to your worship many thanks; that is, I give *you* many thanks. Sus *or* los *hijos de vmd., señor, son amables, his* or *the* sons of your worship, sir, are amiable; that is, your sons, sir, are amiable. *Mis hijas y las suyas de vmd. son jóvenes*, my daughters and *yours* (*his of* your worship) are young.

Vocabulary.

Calle (fem.), street.	*Cabeza*, head.
Mano (fem.), hand.	*Garganta*, throat.
Sobrino, nephew.	*Ojo*, eye.
Levantó, (he) raised.	*Tomó*, (he) took.
Duele, (it) pains, (it) aches.	*Por*, by, through.

Model Sentences.

Las casas son suyas, the houses are his (or hers, or theirs).	*Pedro es amigo mio*, Peter is a friend of mine.
Los sombreros son suyos de él, the hats are his.	*La muger levantó los ojos*, the woman raised her (the) eyes.
Tu hermana y la mia tienen hambre y sed, thy sister and mine are hungry and thirsty.	*Le duele la garganta de Pedro*, the throat of Peter pains him,[a] *i. e.* Peter's throat is sore.

[a] Literally, "to-him pains the throat of Peter."

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Spanish-English.

Mis amigos hallaron un tesoro en el camino. Un amigo mío halló un sombrero. Tu hijo vió un libro en la calle. El juez habló á sus amigos. Mi madre tiene hambre. Su criado tiene sed. Su hija tiene tres cucharas. Todos mis libros son tuyos. Yo voy á su casa. Nuestras criadas son oulpables. El libro es mio. La cuchara es tuya. Los sombreros son nuestros. Mi padre me vió. Las casas son suyas de él. Los caballos son suyos de ella. Las cucharas son suyas de ellos. Las casas son mias.

Tu madre y la mia tienen prudéncia. Tus hermanos y los mios son muy pobres. Sus hermanas y las nuestras son sobérbias. Pedro es sobrino mio y suyo de ella. El médico es amigo mio y suyo de él. Una criada mia halló un sombrero en la calle. El dió el libro á un amigo nuestro. El levantó las manos. Ella levantó los ojos. Pedro levantó la cabeza. El criado tiene un sombrero en la mano. Ella le tomó por la mano. El la tomó por la mano. La cabeza me duele. Te duele la cabeza. La cabeza les duele. Me duele la garganta. La cabeza nos duele. La garganta le duele. La garganta les duele. El pintor le tomó el sombrero, y fué á casa del médico. La muger los tomó los sombreros. Mi sobrino levantó la cabeza.

Vmd. tiene su dinero. La muger tiene su libro. Vmd. escribió algunas cartas á sus amigos. Vms. dieron tres libros á sus criadas. El médico le dió á vmd. muchos libros. Su hijo de vmd. es muy amable. Sus hijas de vmdes. son muy hermosas. Las casas son suyas de V. Los caballos son suyos de VV. Sus hermanas de Vd. son amabilísimas. Sus libros de Vms. son buenos. Vm. halló su dinero.

English-Spanish.

My friend is rich. My mother is poor. My friends found a treasure in the road. Thy sister saw a book in the street. A friend of mine found a hat. The physician spoke to his friends. My brother is hungry. His horse is strong. All my books are thine. His female-servent is thirsty. I am going to his (or her) house. Our female-servants are talkative. This book is mine. The spoon is thine. The hats are mine. The houses are mine. The books are ours. My father saw me. The houses are his (*suyas de él*). The spoons are hers. The horses are theirs.

Thy house and mine (*la mía*) are beautiful. Thy mother and mine have prudence. Thy brothers and mine are very poor. Thy sisters and ours are proud. Peter is (a) nephew of mine and hers. The painter is a friend of mine and his. A female-servent of mine found a hat in the street. He gave the book to a friend of ours. She raised her hands. He raised his eyes. Peter raised his head. She raised her eyes. The male-servant has a hat on (*en*) his (*la*) head. He took her by her hand. She took him by his hand. My head aches (the head to-me aches). Thy head aches (to-thee aches the head). His head aches. Peter's head aches. My throat pains me. Thy throat is sore (*duele*). The physician took his hat, and went to (the) house of the painter. The women took their hats.

[In the remaining exercises, when the second person (you or your) occurs, it is to be rendered by *vmd.* and its objective cases and possessive pronoune; thus, You found your book, *vmd. halló su libro*, literally, your-worship found his book. So, John gave the book to you, *Juan le dió el libro*, or *Juan le dió á vmd. el libro*, literally, John gave the book to him, *i. e.* to your-worship.]

The painter has your book. You have your money. You wrote letters to your friends. You gave a book to your father. You (plur.) gave to your male-servents two silver spoons. The physician gave you (to-him gave to your-worship) many books. Your* son is very amiable. Your daughters are very beautiful. The houses are yours (*suyas de vmd.*). The horses are yours. The oxen are yours. The painter gave you three hats. Your sons are proud. Your sisters are most amiable. You have not your money. The woman has not your book. You wrote not letters to your friends. Your father is rich.

* That is, "his son of your-worship," *su hijo de vmd.*

FRENCH READINGS.—No. XXVIII.

LA VIERGE[a] AUX RUINES.

Section I.

Le 24 juillet 1794, à quatre heures du matin, une charrette quittait lentement la ville d'Arras,[1] conduite par un roulier et escortée par quatre gendarmes.[2] Elle renfermait cinq prisonniers.[3] Cette triste caravane partit de la maison commune,[b] se dirigeant sur Cambrai,[4] où siégeait un tribunal révolutionnaire.

Ces prisonniers avaient été liés fortement de grosses cordes.[5] L'un était un fermier du prince de Vaudemont,[6] accusé d'avoir favorisé l'évasion d'un aristocrate, car on appelait crime, alors, l'action de soustraire au bourreau une proie innocente. L'autre était un vénérable vieillard aux[c] longs cheveux blancs, depuis longtemps curé[7] d'un village aux environs d'Arras; la révolution l'avait surpris enseignant la vertu et la paix[8] à ses paroissiens. Il venait d'être[d] dénoncé et arrêté comme prêchant la révolte.[9] Les trois autres captifs étaient des sœurs hospitalières[e] d'Arras,[10] accusées d'aristocratie, elles qui avaient fait vœu d'humilité. Le vieux prêtre récitait à demi voix le triste psaume[11] de *Miserere*,[f] et les sœurs répondaient les versets.[12]

Le jour commençait à poindre. De légers nuages flottant dans l'air, s'empourpraient des premiers feux du soleil,[13] tandis que du côté de l'occident, encore dans la nuit, les étoiles semblaient ranimer leurs feux pour lutter avec la clarté naissante;[14] mais peu à peu elles pâlirent et semblèrent s'enfoncer dans l'azur du ciel. Les oiseaux, hors de leurs nids, commençaient leurs chansons matinales,[15] et annonçaient le réveil de la nature.

A ce magnifique spectacle, le dernier peut-être qu'ils dussent voir,[g] les prisonniers devinrent silencieux,[16] ils admirèrent la grandeur de la divinité, et des larmes coulèrent à travers leurs paupières.

—Dieu, le créateur de ces merveilles, jette peut-être sur nous un regard compatissant,[17] dit le vieux prêtre, élevons nos âmes vers lui; et d'une voix grave et solennelle il se mit[h] à prier.

En ce moment, un des gendarmes cria au roulier de presser le pas,[18] et les chevaux prirent, sous le fouet de leur maître, une allure assez décidée. Quatre heures après, ils arrivaient à Cambrai[19] et se dirigeaient vers la prison de la ville.

Dès le matin, l'accusateur public nommée Cambrière, dressait, à la geôle, la liste de ceux qui devaient ce jour-là être appelés au tribunal révolutionnaire.[20] En cet instant, la charette entra et deux porte-clefs commencèrent à en descendre le vieux prêtre qui s'appelait Jacques Béranger,[21] et le déposèrent dans un coin du préau. Ils détachaient déjà une des sœurs,[22] lorsque le geôlier survint, et s'écria:

—Mais, citoyen Cambrière, je n'ai plus de place pour loger ces aristocrates![23]

—Eh bien, ne t'en mets pas[i] en peine,[24] répondit l'accusateur public, je vais les envoyer tout droit au tribunal révolutionnaire, ils m'y trouveront.

Colloquial Exercise.

1. Que se passait-il le vingt-sept juillet 1794?
2. Comment la charrette était-elle escortée?
3. Que renfermait-elle?
4. Quel chemin prit la triste caravane?
5. Comment avait-on traité ces prisonniers?
6. Qui était l'un d'eux?
7. Quel était le vieillard vénérable
8. Que faisait-il lorsque la révolution le surprit?
9. Sous quel prétexte l'avait-on arrêté?
10. Quels étaient les trois autres captifs?
11. Que faisait le vieux prêtre?
12. Que faisaient les sœurs de charité?
13. Que pouvait-on remarquer dans l'air?

14. Que voyait-on à l'occident?
15. Que faisaient les oiseaux?
16. Quels sentiments éprouvèrent les prisonniers à ce spectacle?
17. Que dit le vieux prêtre?
18. Que cria un des gendarmes?
19. Que se passait-il quatre heures après?
20. Que faisait l'accusateur public?
21. Que firent deux porte-clefs?
22. Que faisaient-ils déjà lorsque le geôlier survint?
23. Que dit le geôlier à Cambrière?
24. Que répondit l'accusateur public?

NOTES AND REFERENCES.—*a.* vierge, *madonna.*—*b.* maison commune, *city hall.*—*c.* aux *with.*—*d.* L. S. 25, R. 2.—*e.* sœurs, hospitalières, *hospital sisters* or *sisters of charity.*—*f.* the 51st.—*g.* qu'ils dussent voir, *which they were to see.*—*h.* L. S. 68, R. 3.—*i.* l'accusateur public, *the prosecuting attorney.*—*j.* ne t'en mets pas en peine, *do not trouble yourself about it.*

SECTION II.

Et sur un signe, les porte-clefs[a] abandonnèrent la voiture,[1] qui se rendit aux lieux où Cambrière et Lebon tenaient leurs audiences: le vieux prêtre fut oublié dans la cour.[2]

Et celui-là! dit un des geôliers;[3] le citoyen Cambrière n'aura pas son compte.

—Bah! reprit un autre, il sera sans doute pour demain;[4] il en a assez pour aujourd'hui.

Jacques Béranger fut enfermé dans un cachot[5] avec vingt autres prisonniers, tandis que le fermier et ses compagnes de voyage étaient conduits[b] au tribunal,[6] et une heure après, la même charrette les conduisait[c] à la guillotine, dressée sur la place d'armes

Le lendemain, les citoyens Cambrière et Lebon ne devaient[d] pas siéger au tribunal révolutionnaire.[7] Le surlendemain, ils allaient reprendre leurs terribles fonctions, lorsqu'on reçut la nouvelle[8] de l'événement du 9 thermidor qui frappait Robespierre, anéantissait le pouvoir de ses séides, et les menaçait de cet échafaud,[9] sur lequel ils avaient fait[e] périr tant de victimes. Les rues de Cambrai retentirent de cris d'allégresse;[10] une partie du peuple se porta sur la place d'armes et renversa cette guillotine rougie de tant de sang,[11] tandis que l'autre courut à la prison,[12] en enfonça les portes, délivra les prisonniers et les porta en triomphe.[13] Quelle joie pour ces malheureux qui se croyaient voués à la mort,[14] et qui voyaient s'ouvrir devant eux les portes de la liberté!—Chacun parmi la foule, trouvait un parent, un ami, un frère, une épouse;[15] c'étaient des embrassements, des rires et des larmes. Jacques Béranger, le bon prêtre, bien qu'il fût un des derniers à quitter la prison de Cambrai, avait cependant hâte de retourner à Arras,[16] où étaient restées deux jeunes filles, ses nièces.[17] Aussi prit-il d'un pas pressé le chemin de sa modeste demeure.[18] Il marchait en remerciant Dieu de sa bonté infinie, lorsqu'il vit une voiture[19] dont le conducteur abreuvait les chevaux à une fontaine, près du chemin.

Ah! c'est vous, Monsieur Béranger? vous voilà libre?[20] dit le charretier en l'apercevant. Eh bien! j'en suis bien aise.

—Merci, mon ami, Grâce à Dieu, l'échafaud est renversé[f] et les prisonniers courent les champs.[f]

—Voulez-vous profiter de ma charrette?[21] C'est celle qui vous a amené; mais il ne faut pas m'en vouloir,[g] voyez-vous; il n'y avait pas moyen de refuser si l'on tenait[h] à sa tête. Voyons, monsieur le curé, montez à côté de moi; le chemin est long,[22] le soleil est brûlant et la route poudreuse.

—J'accepte, mon ami.[24] Votre voiture me menait, il y a deux jours, à la mort; maintenant elle me ramène auprès de ma famille. J'ai hâte d'y arriver.

Quand ils entrèrent dans la ville d'Arras, la nuit était venue. Le charretier ne voulut point accepter de récompense: le vieillard l'embrassa et se dirigea vers la demeure[25] où lui et ses nièces s'étaient tenus cachés pendant le règne de la terreur.

COLLOQUIAL EXERCISE.

1. Que firent les porte-clefs sur un signe de Cambrière?
2. Que devint le vieux prêtre?
3. Que dit alors un des geôliers?
4. Que répondit un autre?
5. Où plaça-t-on Jacques Béranger?
6. Qu'étaient devenus ses compagnons de voyage?
7. Y eut-il séance le lendemain au tribunale révolutionnaire?
8. Qu'arriva-t-il le surlendemain?
9. Quel était l'effet de cet événement?
10. Que se passa-t-il alors dans les rues de Cambrai?
11. Que fit une partie du peuple?
12. Où alla l'autre partie?
13. Que fit-elle des prisonniers?
14. Quel changement y avait-il dans la position des prisonniers?
15. Que trouvait chacun parmi la foule?
16. Quel sentiment éprouvait alors le bon prêtre?
17. Avait-il laissé des parents à Arras?
18. Que fit-il alors.
19. Que vit-il en poursuivant son chemin?
20. Que lui dit le voiturier?
21. Que répondit le vieillard?
22. Quelle offre le voiturier fit-il?
23. Que dit-il du chemin?
24. Que dit le curé en acceptant?
25. Où le vieillard alla-t-il en quittant la voiture?

NOTES AND REFERENCES.—*a.* L. part ii., § 9, R. (6).—*b.* L. S. 45, R. 2.—*c.* from *conduire*; L. part ii., p. 82.—*d.* L. S. 34, R. 5.—*e.* L. S. 98, R. 7.—*f.* courent les champs, *are free.*—*g.* L. S. 93, R. 6.—*h.* L. S. 89, R. 3.

SECTION III.

Dans une pauvre chambre, sous le toit, étaient assises deux jeunes filles[1] travaillant. Une lampe de terre éclairait cette triste demeure, qui n'avait d'autres meubles qu'un lit vermoulu,[2] une table et deux ou trois chaises. Les deux jeunes filles cousaient[a] en silence. Jeanne l'aînée, la tête baissée, laissait tomber quelques larmes sur ses mains blanches et maigres.[3] Marguerite, la plus jeune, la regardait à la[b] dérobée,[4] et semblait faire effort pour retenir sa douleur; enfin, ne pouvant plus la contenir, elle laissa sortir[c] de sa poitrine un long gémissement. Jeanne, ayant levé les[d] yeux sur sa sœur, lui dit en la contemplant avec tendresse:

Marguerite, tu sais[e] le précepte de notre bon oncle:[5] Dieu est le maître: ce qu'il fait est bien fait.

Puis elle se tut,[f] et toutes deux continuèrent à travailler.

—Pauvre oncle! reprit Marguerite, où est-il maintenant?[6] peut-être est-il mort.

—Oh: ne dis pas cela,[7] reprit Jeanne, cette pensée me fait peur; et pourtant, dans la détresse où nous sommes, ne vaudrait-il[g] pas mieux qu'il fût au ciel? Dieu aura été clément envers lui.

—Jeanne répondit Marguerite, Dieu a déjà pitié de nous,[8] puisqu'il nous a envoyé du travail, alors que tant de pauvres en manquent; au moins, nous aurons du pain, et combien n'en ont pas! Oh! Dieu est bon.

—Oui, Dieu est bon, puisqu'il nous a laissées[h] ensemble.[9] A ces mots les deux jeunes filles se jetèrent dans les bras l'une de l'autre;[10] puis elles se remirent au travail.

En ce moment on frappa à la porte.[11] Les deux sœurs effrayées tressaillirent[12] en se serrant l'une contre l'autre; elles s'interrogeaient du regard[13] sur ce qu'il fallait faire, lorsqu'un second coup plus fort[14] vint augmenter leur perplexité; mais une voix du dehors[i] s'écria,

Jeanne, Marguerite, c'est moi,[j] ouvrez donc![15] A cette voix bien connue, Marguerite s'élança pour ouvrir la porte,[16] et reçut dans ses bras son bon oncle, le vénérable Jacques Béranger.

Jeanne était restée assise,[17] incapable d'aucun mouvement,

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elle regardait d'un air offaré ce bon vieillard,[19] qu'elle croyait mort ou du moins au fond d'un cachot.

Eh bien! qu'as-tu ma Jeanne?[19] lui dit-il en lui prenant les mains; ne me reconnais-tu pas? c'est moi, c'est ton oncle.

A cette voix, le sentiment revint à la jeune fille,[20] un long sanglot sortit de sa poitrine, et elle s'élança au cou du vieillard sans pouvoir proférer une parole.

Est-ce bien possible? disait Marguerite, vous nous êtes rendu! pour toujours, n'est-ce pas?[21] Oh! il n'y a plus de malheurs possibles.... vous êtes là![21]

Alors le vieillard leur raconta ce qui était arrivé[22] et comment il avait été rendu à la liberté. Après cela Marguerite et Jeanne ouvrirent la pauvre chambre de leur oncle,[23] qu'elles avaient tenue fermée, pendant courte absence, et il y rentra en bénissant le Seigneur de toute son âme,[24] car il croyait l'avoir quittée pour jamais.

Colloquial Exercise.

1. Qui était assis dans une pauvre chambre?
2. Quels meubles y voyait on?
3. Que faisait l'aînée?
4. Que faisait Marguerite?
5. Que dit Jeanne, contemplant sa sœur avec tendresse?
6. Qu'ajouta Marguerite à l'égard de son oncle?
7. Que lui répondit Jeanne?
8. Que répondit Marguerite, alors?
9. Que dit Jeanne de la bonté de Dieu?
10. Que firent alors les deux jeunes filles?
11. Qu'arriva-t-il en ce moment?
12. Quel sentiment éprouvèrent les deux sœurs?
13. Se regardaient-elles?
14. Qu'entendit-on encore?
15. Que dit alors une voix du dehors?
16. Que fit Marguerite, reconnaissant la voix?
17. Où était Jeanne alors?
18. Que faisait-elle?
19. Que lui dit le bon vieillard?
20. Qu'arriva-t-il alors à la jeune fille?
21. Que disait alors Marguerite?
22. Que fit alors le vieillard?
23. Que firent les deux sœurs?
24. Que fit le vieillard en rentrant dans sa chambre?

Notes and References.—*a.* from *coudre;* L. part ii., p. 34.—*b.* à la dérobée, *unperceived.*—*c.* laisa sortir, *fetched.*—*d.* L. part ii., § 77, R. (9).—*e.* from *savoir;* L. part ii., p. 104.—*f.* from *se taire;* L. part ii, p. 108.—*g.* from *valoir;* L. part ii., p. 108.—*h.* L. S. 41, R. 7.—*i.* dehors, *outside.*—*j.* L. S. 80, R. 1.—*k.* L. S. 93, R. 3.

Section IV.

Deux années s'écoulèrent au milieu d'un travail assidu.[1] Il paraissait léger aux jeunes filles, car ce travail nourrissait celui qui les avait recueillies[2] orphelines. Cependant, cette quiétude devait[a] être troublée,[3] car Dieu envoie des épreuves pénibles à ses fidèles serviteurs. Le marchand pour lequel travaillaient Jeanne et Marguerite, fit[b] de mauvaises affaires,[4] et s'enfuit, emportant une assez forte somme qu'il leur devait pour des travaux terminés; et par ce départ, le travail leur manquant tout à coup, elles se trouvèrent sans pain.[5] Il leur fallut[c] se résigner à vendre peu à peu leurs hardes,[6] afin que jusqu'au dernier moment, le bon Jacques Béranger ignorât l'affreuse position dans la quelle ils se trouvaient.

Le Noël arriva, c'est à dire le 4 nivôse an IV.[d] Le propriétaire des deux chambres que l'oncle et la nièce occupaient, vint demander le loyer du semestre.[7] Hélas! il n'y avait pas de quoi le payer. C'était un homme dur,[8] il se fâcha; et Jacques Béranger apprit pour la première fois le dénûment de la petite famille. Jeanne et Marguerite supplièrent vainement le maître de la maison,[9] en lui exposant leur misère.

Que voulez vous? leur répondit-il; je ne puis me payer de belles paroles,[10] le gouvernement ne s'en[e] contente pas pour l'impôt; cherchez un autre asile. Vos meubles resteront c'est à peine s'ils suffiront pour me payer.

—Oh! Monsieur, dit Jeanne, tout vous appartient ici.[11] Mais je vous le demande en grâce, laissez-nous ce tableau, c'est un héritage[f] de famille;[12] nous y portons, ma sœur et moi une affection toute particulière.

—Ici tout est à moi, le tableau comme le reste,[13] ou bien, trouvez de l'argent!

Jacques Béranger restait muet d'étonnement.[14] A peine put-il articuler une parole en faveur de la demande de ses nièces.

Le soir même survint un huissier,[15] qui leur fit commandement de payer dans les vingt-quatre heures.

Pauvres enfants, elles se couchèrent bien tristes? Toute la nuit, à travers la mince cloison qui les séparait du vieillard, elles l'entendirent gémir et soupirer.[16]

Le lendemain l'huissier revint; il saisit tous les meubles,[17] au nom du propriétaire, et quelques jours après, une affiche collée sur la porte annonçait qu'un pauvre mobilier serait vendu sur la place publique. A midi on enleva tout;[18] les deux jeunes filles et le vieillard restèrent ensemble, Jeanne et Marguerite pleuraient en silence.[19] Le bon prêtre, appuyé contre le mur,[20] car il n'avait pas même une chaise pour s'asseoir, était morne et abattu. L'huissier rentra, fit une recherche minutieuse, et leur dit d'une voix émue:

Pardonnez-moi d'ajonter encore à votre douleur,[21] mais j'exerce un devoir rigoureux....il faut que j'emporte la clef de cette chambre.

Il n'osait[g] leur dire de s'en aller.[22]....

Jacques Béranger comprit, et, prenant ses nièces par la main, sortit,[23] en jetant un dernier regard sur cette demeure qui l'avait abrité, lui et les siens, durant les orages de la révolution. Une pauvre voisine était sur le pas de sa porte ouverte; sans mot dire, elle leur montra sa chambre,[24] ce qui signifiait:

Voila tout ce que j'ai; partageons.[25]

Colloquial Exercise.

1. Combien de temps passèrent-ils ainsi?
2. Quel était l'effet du travail des jeunes filles?
3. Cette tranquillité dura-t-elle?
4. Que fit le marchand?
5. Quelle fut pour les jeunes filles la conséquence de la fuite du marchand?
6. Que leur fallut-il faire?
7. Qu'arriva-t-il an Noël?
8. Quelle homme était le propriétaire?
9. Que firent vainement Jeanne et Marguerite?
10. Que répondit le propriétaire?
11. Que lui dit Jeanne?
12. Que demanda-t-elle au propriétaire?
13. Que lui répondit-il?
14. Quel sentiment éprouvait Béranger?
15. Qu'arriva-t-il le soir même?
16. Qu'entendirent les jeunes filles pendant la nuit?
17. Que fit l'huissier le lendemain?
18. Que fit-on à midi?
19. Que faisaient Jeanne et Marguerite?
20. Où était le vieillard?
21. Que leur dit ensuite l'huissier?
22. Que n'osait-il faire?
23. Que fit alors Jacques Béranger?
24. Que fit une pauvre voisine sur le pas de sa porte?
25. Que semblat-elle dire aux malheureux?

Notes and References.—*a.* devait, *was;* L. S. 34, R. 5.—*b.* from *faire;* L. part ii., p. 92.—*c.* L. S. 47, R. 2.—*d.* the 4th year of the French republic.—*e.* en, *with such coin.*—*f.* héritage de de famille, *heirloom.*—*g.* L. part ii., § 138, R. 2.

Section V.

Les deux sœurs entrèrent en pleurant.[1]

Vous le voyez, mes enfants, leur dit le bon ecclésiastique, Dieu ne nous abandonne pas?....Du courage![2]

Sur la place, on vendait le mobilier;[3] déjà la table, les chaises,[4] les lits étaient adjugés; le tableau seul restait. Jacques Béranger s'approcha et le contempla une dernière fois d'un œil humide.[5]

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Voyons, dit le crieur, combien pour le tableau ?[16]

—Un petit écu,[17] dit un marchand.

A un petit écu le tableau ![18] vociféra le crieur. Cela n'est pas cher.

Jacques Béranger allait s'enfuir,[19] lorsqu'une voix, partie de la foule cria :

Cent livres ![20]

Le prêtre s'arrêta ; avec cent livres le propriétaire était payé et bien au delà. Il eût volontiers embrassé ce protecteur inconnu.[21]

—Deux cents livres ![22] dit une autre voix.

Un murmure circula dans la foule.

Dans ces temps de révolution, alors que la religion du Christ était proscrite, c'était presque un crime d'acheter un tableau ayant un sujet religieux. Cependant un étranger se fit jour[a] à travers la foule,[23] et jetant autour de lui un regard dédaigneux, il cria,

Cinq cents livres ![24]

—Huit cent ![25] dit un brocanteur.

—Mille ! répliqua l'étranger.

—Qu'est-ce donc,[b] Monsieur ?[26] demandèrent à Jacques deux officiers qui passaient.

—C'est mon mobilier que l'on vend,[27] Messieurs, répondi, humblement le vieillard ; voilà un tableau qui va déjà[c] à mille livres. C'est une richesse que je ne me soupçonnait pas.

—Oh ! voyons cela,[28] dit le plus âgé des deux officiers après avoir considéré le vieillard avec émotion.

—Dix mille livres ![29] cria-t-il avant d'avoir percé[d] la foule. Ce cri lui fit ouvrir une large place,[30] et bientôt il se trouva au premier rang, en extase devant la toile.[e]

L'étranger surpris ajouta à son tour ;

Quinze mille ![31]

Mais l'officier offrit de nouveau :

—Soixante mille ![32]

Le murmure augmenta dans la foule,[33] et de sourdes menaces s'adressèrent à l'enchérisseur.

—Respect au génie ![34] s'écria l'officier. C'est l'œuvre d'un peintre très célèbre, de Raphaël. Je l'offrirai au gouvernement français comme une riche conquête.

Cet homme était un des plus braves généraux de la république.[35]

Jugez de la joie de la pauvre famille !

Jacques Béranger plaça sûrement ses fonds avec hypothèque,[36] et loua à la campagne une petite maison que ses nièces et lui allèrent habiter,[37] ainsi que la bonne voisine qui les avait recueillis.[f]

Aujourd'hui le tableau de la *Vierge aux Ruines* se trouve dans le musée du Louvre.[38]

RE'NE' DE SAINT-LOUIS.

COLLOQUIAL EXERCISE.

1. Que firent les deux sœurs ?
2. Que leur dit le bon ecclésiastique ?
3. Que se passait-il sur la place ?
4. Qu'avait-on déjà vendu ?
5. Que fit alors Jacques Béranger ?
6. Que dit le crieur ?
7. Qu'offrit d'abord un marchand ?
8. Que vociféra le crieur ?
9. Qu'allait faire Jacques Béranger ?
10. Que cria une voix partie de la foule ?
11. Quel sentiment ressentit le prêtre ?
12. Que dit une autre voix ?
13. Que fit alors un étranger ?
14. Que cria-t-il ?
15. Que dit un brocanteur ?
16. Que demandèrent à Jacques deux officiers qui passaient ?
17. Que leur répondit-il ?
18. Que dit le plus âgé ?
19. Que dit-il, après avoir considéré le vieillard ?
20. Quel fut l'effet de ce cri ?
21. Qu'ajouta l'étranger surpris ?
22. Qu'offrit de nouveau l'officier ?
23. Que se passa-t-il dans la foule ?
24. Que dit alors l'officier ?
25. Qui était cet homme ?
26. Que fit, de ses fonds, Jacques Béranger ?
27. Où alla-t-il avec ses nièces ?
28. Qu'est devenu le tableau ?

NOTES AND REFERENCES.—*a.* se fit jour, *penetrated ;* from *faire ;* L. part ii., p. 92.—*b.* qu'est-ce donc ? *what is all this ?*—*c.* va déjà, *reaches already ;* from *aller ;* L. part ii., p. 76.—*d.* L. S 41, R. 8.—*e.* toile, *canvas.*—*f.* recueillis, *received.*

CHRONOLOGY.—No. IV.

A D.
4.—Tiberius adopted by Augustus.
6.—Archelaus, son of Herod the Great, banished
12.—Tiberius associated with Augustus in the Empire
14.—Death of Augustus, and commencement of the reign of Tiberius.
17.—Ovid the poet dies in exile.
26.—Tiberius retires to Capreæ, never re-visiting Rome again.
30.—Crucifixion of OUR SAVIOUR.
31.—Martyrdom of Stephen. Conversion of Paul.
42.—Great Famine throughout Palestine.
43.—Claudius Cæsar arrives in Britain.
50.—Jews banished from Rome.
54.—Nero becomes Emperor of Rome.
61.—Queen Boadicea heads the Britons against the Romans, but is defeated by Suetonius, and put to death.
64.—Destruction of Rome by fire.
66.—Martyrdom of St. Paul. Revolt of the Jews against the Romans in Palestine.
68.—Jerusalem besieged.
70.—Titus, son of the Emperor Vespasian, captures the city and Temple of Jerusalem, and entirely destroys both : the plough is passed over the site of the city.
75.—Temple of Peace dedicated at Rome ; the spoils of the Temple of Jerusalem placed in it.
79.—Great Eruption of Vesuvius. Destruction of the cities of Herculaneum and Pompeii. Pliny the Elder killed.
84.—Great Roman wall built between Britain and Caledonia.
87.—The Emperor Domitian assumes the titles and honours of divinity.
88.—Outbreak of persecution against the Christians.
96.—Assassination of Domitian, and accession of Nerva.
98.—Nerva succeeded by Trajan.
105.—Trajan's bridge over the Danube built.
106.—The country of the Dacians reduced by Trajan to the condition of a Roman province.
113.—Erection of Trajan's Column.
116.—Trajan extends the boundaries of the Roman Empire to the Tigris ; under him the empire attains its widest limits.
121.—The Emperor Hadrian arrives in England, and erects a wall from Carlisle to Newcastle.
130.—Jerusalem erected into a Roman colony, under the title of Ælia Capitolina
131.—Revolt of the Jews under Barchobab, who announces himself as the true Messiah.
136.—Suppression of the Jewish revolt, after a war in which more than half a million of Jews were sacrificed.
138.—Death of Hadrian, who is succeeded by Antoninus Pius
146.—Justin Martyr writes his "Apology for Christianity."
152.—The persecution of the Christians stayed by Antoninus Pius.
161.—Death of Antoninus Pius
164.—Martyrdom of Polycarp and Justin
178.—Destruction of Smyrna by an earthquake.
191.—Great fire at Rome.
202.—The Emperor Severus issues a decree against the Christians. Tertullian and Clement, fathers of the Christian Church, flourished.
207.—Severus arrives in Britain.
211.—Severus dies at York.
219.—Temple of the Sun erected at Rome.
222.—The decline of the glory of the Roman Empire begin about this time.
254.—Origen, Christian writer, flourished.
255.—Irruption of the Goths.
258.—The Goths take Trapezium.
269.—Claudius defeats the Goths
274.—Birth of Constantine the Great.
275.—Aurelian murdered.
284.—Diocletian made Emperor of Rome
286.—Diocletian associates with himself Maximianus, under the title of Cæsar.
292.—Two emperors and two Cæsars march to defend the four quarters of the Roman Empire.
296.—Constantine accompanies Diocletian to the Egyptian war.
303.—Diocletian issues his decree against the Christians.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

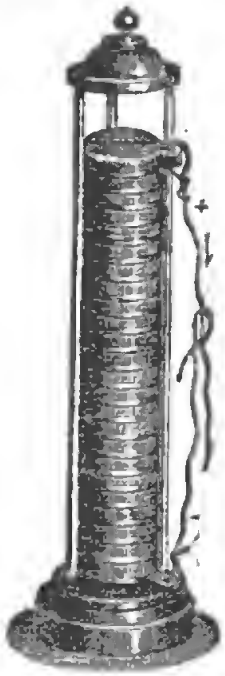
No. LXI.

(*Continued from page* 116.)

DYNAMIC ELECTRICITY.

The Voltaic Pile.—The name of *pile* is given to all apparatus which serve to develop dynamical electricity. The first apparatus of this sort, which was invented by Volta in the year 1800, consists of a series of discs piled one upon the other in the following order: a copper disc, a zinc disc, a piece of wet cloth, then again a copper disc, a zinc disc, and a piece of wet cloth, once more a copper disc, a zinc disc, and a piece of wet cloth, and so on always in the same order, as shown in fig. 418. Hence the name of *pile*, which is still

Fig. 418.



continued, though this apparatus is now arranged in very different ways. Generally the zinc and copper discs are soldered two and two together, so as to form *couples*, separated by linen cloths and kept vertical by means of three glass tubes full of water, as the figure shows. The form of this apparatus has led to its being called the *column pile*.

The distribution of electricity in this pile is not the same when it is isolated at one end only—which is the case when it rests on the ground—as it is when it is isolated at both ends, by placing it on a glass or resin plate.

In the former case, experiment shows that the extremity in communication with the earth is in a natural state, and that the remainder of the pile contains only one kind of electricity, which is positive if the end communicating with the earth terminates in a copper disc, and negative if it is a zinc one. As to the tension, it ought to increase, according to Volta's theory, in proportion to the number of the couples, but experiment shows that it increases more slowly.

The distribution of electricity is not the same in the pile that is isolated at both ends. It is proved by the electrometer, that the middle portion is then in a natural state, that each half of the pile is charged with only one kind of electricity, the one with positive and the other with negative, and that the tension increases in both parts from the middle to the extremities. It is the half with zinc at the end that is charged with positive electricity, and that with the copper at the end is charged with negative electricity.

Tension of the Pile.—The tension of a pile is the tendency of the electricity accumulated at its extremities to disengage itself and overcome the obstacles which oppose its removal. The student must be careful not to confound the tension of a pile with the quantity of electricity that it can set free. The tension depends principally upon the number of the couples, while the quantity of electricity increases with the surface of the couples, other things being equal. The larger this surface is, the larger also is the quantity of electricity which circulates in the pile, supposing the tension to be equal. This quantity also increases with the conductibility of the liquid interposed between the couples. The tension, on the contrary, is independent of the nature of this liquid.

Except for a considerable number of couples, the tension at the extremities of the pile is always less than in electrical machines. In fact, not only does each extremity, considered in itself, give no spark, but it does not even attract light bodies. It is only by means of the condensing gold-leaf electrometer that we can render the tension perceptible. For this purpose, bring one of the plates of the electrometer into communication with one of the extremities of the pile and the other with the earth. The apparatus is then instantly charged, and on breaking the communication with the pile and the earth, the pieces of gold-leaf will be seen to diverge. We can also charge a Leyden jar by bringing the internal armature into communication with one of the extremities of the pile, and the external armature with the other extremity, but this charge is much weaker than that obtained by the electrical machine.

Poles, Electrodes, Currents.—In a pile, that extremity at which the positive fluid tends to accumulate is termed the *positive pole*, and that at which the negative fluid tends to accumulate is called the *negative pole*. In the column pile, and Wollaston's trough piles—of which we shall speak presently—the positive pole is the zinc and the negative the copper end.

The name *rheophori* (current-conductors), or *electrodes* (electricity-paths), is applied to two metallic wires attached to the poles of the pile, fig. 418, for the purpose of bringing them into communication, so that the extremities of these wires themselves become the poles.

Lastly, by the term *current* is denoted the recombination of the contrary electricities, which is carried on from one pole of a pile to the other, when they are brought into communication by means of the electrodes or any conducting substance whatever. The effects of the piles show that the currents are continuous, which proves that in proportion as the two electricities recombine along the connecting wire, the electromotive force, or rather the chemical action, decomposes a fresh quantity of natural electricity.

The current is generally admitted to have one settled direction, and is supposed to go from the positive to the negative pole along the electrodes, and from the negative to the positive in the interior of the pile. But this is only a convention, for the recombination takes place as much from the positive to the negative pole, as from the negative to the positive. In all cases, the current does not commence till the moment when the two poles are put in communication by a conducting body, which is expressed by saying that *the current is closed*. All the properties of electricity in a state of tension then cease, but new properties appear, which characterise the currents, and will be described hereafter, when we come to speak of the effects of the piles.

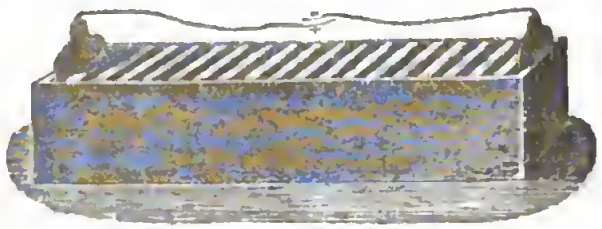
Trough Piles.—The voltaic pile has received various forms. That which we have already described has the disadvantage of pressing the pieces of cloth interposed between the couples, and by the weight of the metal discs squeezing out the liquid with which they are saturated. On this account, it was soon found advisable to make use of the *trough pile*, which is, so to speak, nothing more than a horizontal column pile. It consists of a rectangular wooden box lined inside with an insulating coat of mastic or cement, fig. 419. The zinc and copper plates, soldered together two by two, form couples, which correspond in size to the box, and are fixed in the mastic in such a manner that between the couples there are short intervening spaces or compartments called *troughs*. Into these is poured a mixture of water and sulphuric acid, which produces the same effect as the pieces of cloth in the column pile. The two poles communicate together by means of

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metallic wires attached to two copper plates, which are plunged into the two last troughs. The theory of this pile is exactly the same as that of the column pile.

Wollaston's Pile.—Another modification of the voltaic pile is the *Wollaston* or *jar pile*. The plates of zinc and copper are soldered only at the edges, and only partly so there, the copper plates having a little tongue or strip at the end, which is soldered to the zinc. These plates are bent in such a manner as to dip vertically into glass jars partly filled with acidulated water. But the zinc and copper plates which dip into the same jar belong to different couples, fig. 420. Starting from the left of the figure, a small copper strip *c* is soldered to a thick zinc plate *z*, and the two together constitute the first couple. A second copper plate *a* of the same size as the zinc surrounds it without touching it, and is united with a copper strip *c*, which is soldered to a second zinc plate *z*, forming with it the second couple. The zinc plate of this second couple is in the same manner surrounded with copper *d a*, which is soldered to a third zinc plate, and so on to as many couples as may be desired. The first copper strip *c*, being soldered to a zinc plate, represents the negative pole. As for the positive pole, it corresponds to the last copper plate *c m*, which, not being in contact with any zinc, only takes from the liquid the positive fluid which is supplied to it by the last couple. All the couples are attached to a wooden cross-bar, which can be raised or lowered at pleasure between four uprights, and is removed as soon as the pile is no longer wanted for operation. Generally, the water in the jars is mixed with one-sixteenth of sulphuric acid and one-twentieth of nitric acid; but the pile answers very well with only sulphuric acid in the water.

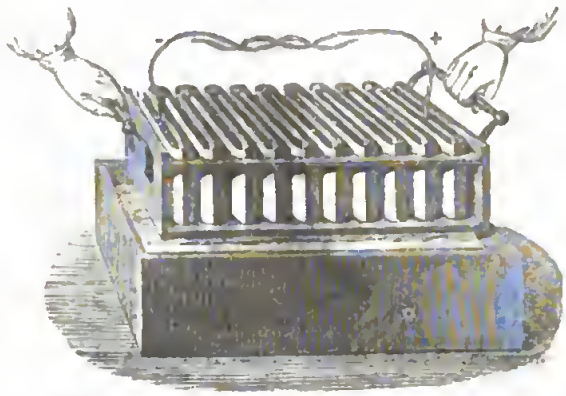
Fig. 419.



Munck's Pile.—M. Munck, professor of natural philosophy at Strasburg, gave Wollaston's pile a more simple form, by making all the couples dip into the same wooden trough lined inside with mastic. Fig. 421, which represents a pile of twenty couples, shows how the plates of these couples are vertically united. This pile occupying a small space, produces very powerful but varied effects.

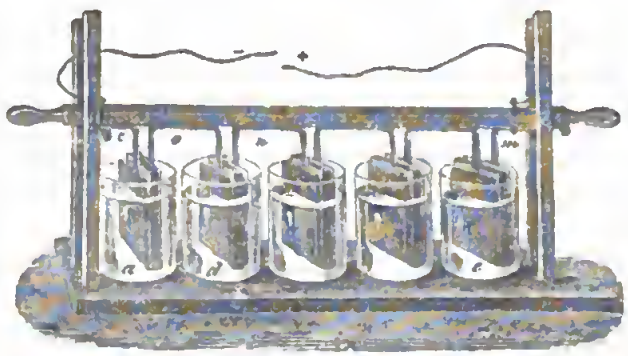
Dry Piles are really column piles, in which the pieces of cloth are exchanged for a solid hygrometrical substance. There are several sorts of them. In Zamboni's pile, which is most frequently employed, the electro-motive metals are tin or silver, and the bi-oxide of manganese. To construct this pile, take a sheet of paper covered with silver or tin-foil on one side, and upon the other put bi-oxide of manganese well washed, in combination with some greasy substance. Having placed seven or eight of these leaves one upon the other, cut them with a punch into circular pieces of about an inch in diameter, and place these discs in regular order, in such a manner that the silver or tin-foil of each disc may be in contact with the manganese of the next. Having thus piled together from twelve to eighteen hundred couples, terminate the pile by a copper disc at each end, and tie the whole system tightly together with silk threads, to make the contact more complete. The positive pole then corresponds to the copper disc in contact with the manganese, and the negative pole to the disc at the other end, that is to say, to the silver or tin pole.

Fig. 421.



Dry poles are remarkable for the duration of their action, which may last for several years. Their power depends much upon the temperature and the hygrometrical state of the air. It is greater in summer than in winter, and may be revived, when it seems extinct, by the action of a strong heat. A

Fig. 420.

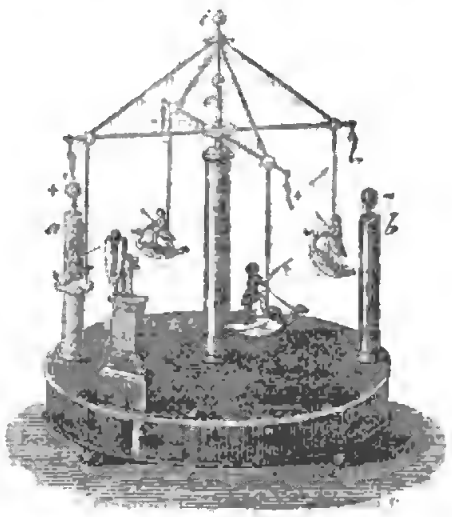


Zamboni's pile of 2,000 couples produces neither shock nor spark, but is capable of charging a Leyden jar and other condensers. But some time is required for this, because the electricity moves but slowly in the interior. The development of electricity in these piles is generally attributed to a slow chemical action, resulting from the decomposition of the organic substances with which the paper is impregnated.

Bohnenberger's Electrometer.—Bohnenberger constructed a dry pile of extreme sensibility. It is a condensing electrometer, fig. 402, p. 98, the rod of which has only one piece of gold-leaf suspended at an equal distance from the opposite poles of two dry piles placed vertically inside the jar, on the board upon which it stands. Directly the gold-leaf is charged with free electricity, it is attracted by one of the piles and repelled by the other, and its electricity is evidently contrary to that of the pile towards which it is directed.

Rotatory Apparatus.—Various small apparatus capable of continued rotation are constructed under the name of *roundabouts*, some of which will go on moving round for several years. Fig. 422 represents an apparatus of this sort. Two

Fig. 422.



copper columns *a* and *b*, fixed on a wooden stand, are connected together at their base, the one with the positive, and the other with the negative pole of a powerful dry pile placed horizontally below the stand. This pile is generally formed of six smaller piles connected together, and comprising in all 1,800 couples.

On a pivot *c*, placed at an equal distance from the two columns *a* and *b*, is an ivory cap *i*, to which are attached four supports sustaining small figures painted on very light cardboard. These supports are terminated by little tinsel streamers fastened with gum-lac, which isolates them. These streamers, at first attracted by the electricity of the balls at the ends of the columns, touch them and are charged with the same electricity that they have. Then being repelled they begin to revolve, and the two positive streamers, for example, which are repelled by the column *a*, are then attracted by the column *b*, which they touch, and are again repelled as before, and so on. Thus a continued rotatory movement is kept up as long as the pile is in operation, that is to say, for several years.

CHEMICAL THEORY OF THE PILE—CONSTANT-CURRENT PILES.

Electricity owing to Chemical Action.—The theory of contact which Volta proposed to explain the production of electricity in the pile, was not long without being attacked by several philosophers. Fabroni, a fellow-countryman of Volta, having observed that in the pile the zinc discs become oxydised on contact with the acidulated pieces of linen cloth, thought this oxydisation was the principal cause of the liberation of the electricity. In England, Wollaston soon advanced the same opinion, and Davy supported it by ingenious experiments.

It is true, that on holding in his hand the zinc end of a system of two plates, zinc and copper, soldered end to end, while the copper extremity touched the collecting plate of the condensing electrometer, Volta had obtained sensible proofs of electricity; but M. de la Rive has shown that if you hold the zinc with a wooden handle, all signs of electricity disappear, and that it is the same if the zinc is placed in gases, such as hydrogen, or nitrogen, which exercise any action upon it. M. de la Rive hence inferred, that the liberation of electricity in Volta's experiment was owing to chemical action, caused by the evaporation from the skin of the hand, or the oxygen of the air.

The development of electricity in chemical action is proved by means of the condensing electrometer, fig. 401, p. 506. For this purpose, place a moistened round piece of paper upon the upper plate, and upon that a zinc capsule, into which pour water and sulphuric acid. Then dip in the liquid a platina plate communicating with the earth, while the lower plate is also brought into communication with it by means of the finger moistened. When you cut off the communications and remove the upper plate, you will find that the pieces of gold-leaf have received a perceptible amount of positive electricity, which shows that the upper plate has been electrised negatively by the chemical action of the sulphuric acid upon the sides of the capsule. Lastly, by means of an extremely delicate apparatus called the galvanometer, which will be described hereafter, M. Becquerel demonstrated that all chemical action, however feeble, is always accompanied by the liberation of electricity.

In spite of the above experiments, the theory of contact is not completely abandoned by natural philosophers, some still maintaining it, particularly Messrs. Marianini, Oben and Poggendorff. M. Becquerel, in his work on Electro-Chemistry, admits that the effects of contact may take place when the affinities are beginning to exercise their action, and consequently before the combinations are effected, but maintains that these effects disappear on the occurrence of those produced by chemical action. In general, the opinion held at the present time is, that if contact develops electricity, it is only in a very feeble degree, and that it is to the electricity resulting from chemical action that the effects of the piles are chiefly owing.

Laws of the Disengagement of Electricity in Chemical Action.—All kinds of chemical action are accompanied by a disengagement of electricity, in which the following laws, laid down by M. Becquerel, and capable of demonstration by means of the condenser and the galvanometer, are observable.

1. In the combination of oxygen with another substance, the oxygen takes the positive, and the combustible the negative electricity.

2. In the combination of an acid with a base, or with bodies acting as such, the former takes the positive, and the latter the negative electricity.

3. When an acid acts chemically upon a metal, the acid is electrised positively and the metal negatively, which is a consequence of the second law.

4. In decompositions, the electric effects are the reverse of the above.

5. In double decompositions, the equilibrium of electric forces is not disturbed.

As for the quantity of electricity disengaged in chemical action, it is enormous; and M. Becquerel has arrived at results which are really quite startling. Faraday found that two wires, one of zinc and the other of platina, each five-eighths of an inch long, and one eighteenth of an inch in diameter, yielded, when immersed in acidulated water, as much electricity in three seconds as was obtained by thirty revolutions of a plate machine, fifty inches in diameter, or required to charge a Leyden battery of 3,600 square inches; and the quantity of oxide of zinc formed to produce this result could not have been appreciable by means of the most delicate balance. He has also shown, that the quantity of electricity developed during the chemical decomposition of a grain of water, cannot be less than that which is contained in the most powerful flash of lightning. And yet so slight is the tension of galvanic electricity, that it will pass only through the best conductors, and requires condensation to give even feeble

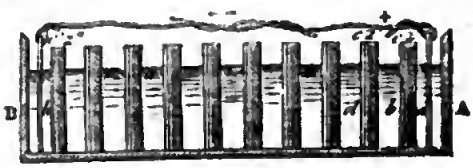
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indications of attraction and repulsion. Its mechanical effects are therefore trifling, while its chemical and physical effects are powerful and important.

Chemical Theory of the Pile.—M. de la Rive, who maintains that chemical action is the sole cause of the disengagement of electricity in the pile, has proposed the following theory on the subject.

If we consider a trough pile, fig. 423, formed of couples of

Fig. 423.



zinc and copper, and the troughs of which contain sulphuric acid diluted with water, the acid of each trough acts upon the zinc, but not upon the copper at an ordinary temperature. There is consequently throughout the whole pile a disengagement of positive electricity to the liquid, and of negative electricity to the zinc of each couple, according to the second of the above laws. Now in the trough *b*, where the liquid is in contact with zinc and copper at the same time, the positive electricity of the liquid constantly recombines with the contrary electricity of the couple *a c*. Similarly in the trough *d*, the positive fluid of the liquid combines with the negative fluid of the couple *c' d'*, and so on throughout the whole pile, so that there are only the electricities of the end troughs *a* and *h* which, not being able to combine with those of the neighbouring troughs, remain free. It is easy to see, that it is the trough *a* which is electrised positively by the action of its acid on the zinc *a*, and the trough *h* which is electrised negatively by the electricity communicated to it from the couple *c' d'*. However, these troughs thus retain only a very small portion of the electricities developed by chemical action, because the greatest part of the two fluids recombines on the contact of the zinc with the liquid, in proportion as the natural electricity is decomposed.

In this theory, as the contrary electricities of the interpolated couples are constantly forming neutral fluid, it follows, that if we join the two poles by a metallic circuit, this latter is never traversed by any other electricity than that developed by a single couple. As for the tension of the piles, it is easy to see that it increases with the number of the couples. In fact, M. de la Rive having found that the conductibility of a liquid mass, separated by metallic partitions, is in inverse proportion to their number, it follows, that the larger the number of intermediate couples, the greater are the obstacles to the recombination of the contrary electricities accumulated at the poles, and the stronger is the tension. It follows also from thence, that in the intermediate couples the tension decreases from the poles towards the middle of the pile, since as the interval between the couples diminishes the resistance to recombination is less. According to the same reasoning, the tension in the central part of the pile is little or nothing.

As the resistance to the recombination of the contrary electricities accumulated at the two poles increases when the intermediate liquid has less conducting power, it must be the same with the tension. In fact, M. de la Rive has ascertained that when the troughs of the pile are filled with acidulated water or common water, the tension is the same. In the former case, the production of electricity is much greater, but the contrary floids recombine more easily.

The theory of M. de la Rive may be applied to all the piles above described, as well as to those to which we shall presently invite the reader's attention, known by the name of *constant-current piles.*

Causes of the Enfeeblement of the Currents.—Secondary Currents.—The various piles previously described—as the column pile, the trough pile, Wollaston's pile and Munck's pile—which all agree in being composed of two metals and one liquid, are attended with the serious inconvenience of producing currents the rapidity of which decreases very fast.

The causes of this phenomenon are, 1, the enfeeblement of chemical action through the neutralisation of the sulphuric acid, in proportion as it recombines with the zinc. 2. The *secondary currents*, that is, currents produced in the piles in a direction contrary to that of the principal current, and owing to the decomposition by the latter of the sulphate of zinc already formed. In this decomposition a layer of zinc is deposited on the copper plates, as will be seen further on, when we come to speak of the decomposition of salts by the pile. It is this layer of zinc which then gives rise to a second current in a contrary direction to the first, and partly neutralising it. Secondary currents are the chief cause of the enfeeblement of the effects of piles.

LESSONS IN MORAL SCIENCE.—No. VIII.

THE NATURE OF VIRTUE (*continued*).—DIFFERENT HYPOTHESES.

Aristotle's idea of the nature of virtue was, that it was a mean between two extremes. Virtue, according to him, consisted in the moderate and just exercise of all the affections and passions; and vice, in defect or excess. It would be easy to show that this definition or description is not complete. It is not sufficiently comprehensive, and includes many things not of a moral nature. But it is unnecessary to dwell on the subject, as the definition is no longer used.

Dr. Samuel Clarke, who has a long established character as a profound thinker, attempted to give a theory of virtue which should be free from exception. He makes virtue to consist in acting according to the fitness of things. Whatever is fit and suitable to be done, taking in all circumstances, is right. But really this gives us no conception of that peculiarity which renders an action virtuous. It is true, all virtuous actions are fit to be done, and are actions suitable to the circumstances of the agent. But every fit action is not a virtuous action, and the fitness of many actions depends on their moral character. Their fitness, therefore, does not render them virtuous, but their being virtuous is the very thing which renders them fit.

Wollaston, in his "Religion of Nature Delineated," refines upon this system, and makes all virtue to consist in a conformity to truth. A virtuous action is one in accordance with the truth of things; which when it comes to be explained, amounts to much the same as Dr. Clarke's "fitness of things." Both of them include, no doubt, all virtuous actions, as they are all fit, and all in accordance with truth; but these definitions do not lead us to a conception of that quality in actions which is *moral*. Certainly all virtuous actions must be in accordance with truth and reason, but this is no definition of the nature of virtue; it is only a circuitous method of saying that some actions are virtuous because they have a fitness to produce a good end. This theory supposes the idea of virtue already to exist; for if the end be not good, mere *fitness* cannot be of the nature of virtue. There are other things which have a fitness to produce certain ends, as well as virtue. It is not mere fitness which renders an action virtuous, but adaptedness to a good end. And unless by truth we understand the same as virtue, it does not appear that a mere conformity to truth gives any conception of a moral quality, and there is as much reality in a vicious action as in one that is virtuous. On this subject Dr. Thomas Brown well observes, "Reason, then, as distinguishing the conformity or unconformity of actions with the fitness of things, or the moral truth or falsehood of actions, is not the principle from which we derive our moral sentiments. These very sentiments, on the contrary, are necessary, before we can feel that moral fitness or moral truth, according to which we are said to estimate actions as right or wrong. All actions, virtuous and vicious, have a tendency or fitness of one sort or other; and every action which the benevolent or malevolent perform, with a view to a certain end, may alike have a fitness for producing that end. There is not an action, then, which may not be in conformity with the fitness of things; and if the feelings of exclusive approbation and disapprobation, that constitute our moral emotions, be not presupposed, in spite of the thousand fitnesses which reason may have shown us, all actions must be morally indifferent. They are not thus indifferent because the

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ends to which reason shows certain actions to be suitable, are ends which we have previously felt to be worthy of our moral choice; and we are virtuous in conforming our actions to these ends, not because our actions have a physical relation to the end, as the wheels and pulleys of a machine have to the motion which is to result from them, but because the desire of producing this very end has a relation, which has been previously felt, to our moral emotion. The moral truth, in like manner, which reason is said to show us, consists in the agreement of our actions with a certain frame of mind which nature has previously distinguished to us as virtuous, without which previous distinction, the actions of the most ferocious tyrant, and of the most generous and intrepid patriot, would be equally true, as alike indicative of the real nature of the oppressor of a nation, and of the assertor and guardian of its rights." The fitness and the truth, then, in every case, pre-suppose virtue as an object of moral sentiment.

The system of Dr. Adam Smith, contained in his "Theory of Moral Sentiments," is very plausible, as stated by its ingenious author, and has captivated many minds, by leading them to believe that the origin of our moral feelings is to be found in the principle of sympathy. According to this able writer, we do not feel the approbation or disapprobation, immediately on the contemplation of virtuous or vicious actions. It is necessary first to go through another process, by which we enter into the feelings of the agent, and of those to whom the actions are related, in their consequences, beneficial or injurious. If, on considering all the circumstances in which the agent was placed, we feel a complete sympathy with the feelings by which he was actuated, and with the gratitude or resentment of him who was the object of the action, we approve of the action as right; or disapprove it as wrong, if our sympathies are of the opposite kind. Our sense of the propriety of the action depends on our sympathy with the agent, and our sense of the merit of the agent, on our sympathy with the object of the action. In sympathising with the gratitude of others, we regard the agent as worthy of reward; in sympathising with the resentment of others, we regard him as worthy of punishment. When we judge of our own conduct, the foregoing process is in some measure reversed; or rather, by a process still more refined, we imagine others sympathising with us, and sympathise with their sympathy. We consider how our conduct would appear to an impartial spectator; we approve of it if we feel that he would approve; we disapprove it if we think that he would disapprove. According to Dr. Smith, we are able to form a judgment as to our own conduct, because we have previously judged of the moral conduct of others; that is, have sympathised with the feelings of others. And but for the supposed presence of some impartial spectator, as a mirror to represent us to ourselves, we should as little have known the beauty or deformity of our own moral character, as we should have known the beauty or ugliness of our own features without some mirror to reflect them to our eye.

That a principle so irregular and capricious as that of sympathy should be made the origin of all our moral distinctions and feelings, is indeed wonderful. One might be tempted to suspect that the gifted author intended to select a subject merely for the display of his ingenuity in framing and defending a plausible hypothesis, and playing on the credulity of his readers.

The great error of this hypothesis is one which is common to most others on this subject: it takes for granted the existence of those moral feelings which are supposed to flow from sympathy—yea, their existence previous to that very sympathy in which they are said to originate. When we suppose this previous moral feeling, it is easy to understand how we are led to approve of actions when we feel sympathy with the agent; but the most complete sympathy of feeling is not sufficient to account for the existence of moral approbation or disapprobation. When there is nothing more than a sympathy of feelings without the previous moral sentiment, no such exercise as that which Dr. Smith supposes could ever arise; so that the process which he describes as originating our moral sentiments, never could take place, unless there existed previously a moral feeling in the mind. In contemplating the beauties of nature or art, we may have a complete feeling of sympathy with another person, our feelings may be in the most exact accordance, and yet no moral approbation of his sentiment of the beautiful be experienced. But if mere agreement in our emotions would give rise to moral feeling, it ought to arise vividly in this case, where the emotions may be strong and in perfect accordance. "Why is it," says Dr. Brown, "that we regard emotions which do not harmonise with our own, not merely as unlike to ours, but as morally improper? It must surely be because we regard our emotions which differ from them as proper. And if we regard our own emotions as proper before we can judge the emotions which do not harmonise with them to be improper on that account, what influence can the supposed sympathy and comperison have had in giving birth to that moral sentiment which preceded the comparison? The sympathy, therefore, on which the feeling of propriety is said to depend, assumes the previous belief of that very propriety. Or, if there be no previous belief of the moral suitableness of our own emotions, there can be no reason, from the mere dissonance of other emotions with ours, to regard these dissonant emotions as morally unsuitable in the circumstances in which they have arisen."

The theory of Dr. Smith not only includes the sympathy which we feel with the agent of an action, but also with the feelings of gratitude or resentment in the object of the action, as it may affect others with benefit or injury. If we feel that in similar circumstances our emotions would sympathise with theirs, we regard the agent in the same light in which they regard him, as worthy of regard in one case, and of punishment in the other; that is, as having moral merit or demerit. It is evident that this is an inadequate and defective account of merit and demerit; for it confines these qualities to actions which relate to the welfare of others; but all impartial men allow that actions of a different kind may have merit or demerit. If a man, from a sincere desire of improvement in virtue, is led to deny himself habitually such gratification of his senses and appetites as would interfere with his progress, and to submit to a course of discipline to overcome evil habits, which is both difficult and painful, and yet perseveres in the midst of numerous temptations to relax, until he has obtained a complete victory over himself; who would say that there is nothing in all this to call forth moral approbation? But the actions have no respect to the happiness of others; there is no gratitude or resentment with which the observer can sympathise.

That theory which considers conformity to the will of God to be virtue is undoubtedly correct; for that faculty in us which approves of virtuous actions was implanted by Him, and is an induction of his will. As soon as we get the idea of a God we cannot but feel that it is the duty of all creatures to be conformed to his will. But if the question be whether, in judging an action to be virtuous, it is necessary to consider distinctly its conformity to the will of God, we are of opinion that this conception is not necessary to enable us to perceive that certain actions are morally good and others morally evil. In order to this judgment, nothing is required but a knowledge of the circumstances and motives of the action. Even the atheist cannot avoid the conviction that particular actions are praiseworthy, and others deserving blame. But though belief in the existence of God is not necessary to the exercise of the moral faculty, yet this belief adds great force to the dictates of conscience, and enables us to account for the existence of a faculty by which we discern qualities so opposite in the actions of moral agents. Indeed, to know that our conduct should be conformed to the will of God, supposes the existence of a moral faculty, of which this is one of the intuitive judgments. If we had no moral faculty, the obligation to be conformed to the will of God would not be felt. It is true, undoubtedly, that it may be inferred from clear data, that ultimately all duty and all virtuous actions may be referred to the will of God as the standard by which they should be tried. Our original intuitive perception of the moral character of certain actions does not, however, take in this idea, but is an immediate judgment of the mind upon observing such actions. Morality is a quality seen in the actions themselves.

If the question be asked, why we should be conformed to the will of God? the answer is, because it is right,—morally right. We must then have a faculty of judging respecting moral obligation before we can know and feel that conformity to the will of God is right.

Virtue is a peculiar quality of certain actions of a moral

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agent, which quality is perceived by the moral faculty with which every man is endued; and the perception of which is accompanied by an emotion which is distinct from all other emotions, and is called moral. This quality being of a nature perfectly simple, does not admit of being logically defined, any more than the colour of the grass, the taste of honey, the odour of a rose, or the melody of tunes.

As some actions are morally good which are virtuous; so there are other actions which are morally evil, or vicious. The perception of these, also, is accompanied by a feeling of a moral kind, but very different from that which accompanies the view of virtuous actions.

Virtue, then, may be said to be that quality in certain actions which is perceived by a rational mind to be good; and vice, or sin, is that which a well-constituted and well-informed mind sees to be evil. Whatever may be the rule or standard of virtuous actions, the immediate judgment of the moral faculty on contemplating the act is necessary. Without a moral faculty we never could have the least idea of a moral quality, good or bad; therefore all actions must be brought before this faculty, and its judgment is ultimate. We can go no further. While the good or evil of some actions is self-evident, much discrimination and reasoning are requisite to arrive at a clear view of the true moral character of others. But the end of these processes is to bring the true nature of the action in question fairly before the mind, when it is judged by the moral faculty. Those actions, then, which a sound and well-informed mind judges to be morally good, are virtuous, and those which such a mind judges or feels to be evil, are sinful.

As has already been explained when treating of conscience, the judgment of the mind respecting moral qualities is the judgment of the understanding, and differs from other judgments only in the subject under consideration. The mind must possess the faculty of moral perception, of which all the inferior animals are destitute. To see that an action is useful, and will produce happiness to him that performs it, or to others, is one thing; but to perceive that it is morally good, is quite a distinct idea; and virtue and mere utility should never be confounded. It may be thought that this account of virtue makes the moral faculty the only standard of moral excellence. In one sense this is true. It is impossible for us to judge any action to be virtuous, which does not approve itself when fairly contemplated by our moral sense. To suppose otherwise, would be to think that we had some other faculty by which to judge of moral actions than the moral faculty. As no judgment of colours can be formed but by the eye, nor of sounds but by the ear, nor of odours and tastes but by the senses of smelling and tasting; so no judgment can be formed on moral subjects but by the moral faculty. It may be asked, then, whether the judgments of this faculty are infallible, and if so, how it is that we have so many discordant opinions respecting the morality of actions. To which it may be answered, that when the mind is in a sound state, and any moral action is presented to it, with all the circumstances which belong to it, the judgment of this faculty is always correct and uniform in all men. As an eye in a sound state judges infallibly of colours, in which judgment all, in precisely the same circumstances, will agree in their perceptions; so it is in regard to moral qualities. If in looking at an object one man has more light than another, or if one occupies a more favourable point of observation, the object will appear differently to the persons thus situated; but this does not prove that their eyes are differently constructed, or that there is any other faculty than the eye by which the object may be surveyed. So in regard to moral qualities, when they are presented to different minds with precisely the same evidence, the moral judgment will be the same. The differences observable in the dictates of the consciences of men may all be traced to some cause which prevents the object from being perceived in its true light; such as ignorance, error, or prejudice. In regard to sin and duty, the ultimate appeal must be to conscience. We may bring considerations of various kinds to bear on the conscience, or to enlighten the mind, so that the moral faculty may be rightly guided; but still our ultimate rule must be the judgments of our own moral faculty.

And here it may be remarked, that conscience will recognize every new relation into which a moral agent enters, and will dictate the obligation to perform the duties obviously arising out of such relations. Or, if such an agent should for a time be ignorant of its relations, and afterwards discover them, it would, upon such discovery, feel an obligation not before experienced. Let us then suppose the case of a child educated in a cave, who, while the intellectual powers were cultivated, and the faculties developed, had never been informed respecting the existence of its parents and the relation it sustains to them. Of course, while in this state of ignorance, there would be no sense of obligation to them; but so soon as the nature of this relation should be clearly made known, the obligation to the obvious duties arising out of this relation would immediately be felt. Let it be supposed, also, that this human being, until grown to maturity, had never heard of God, and of course possessed no idea of such a being. While in that state of ignorance, it could have no sense of the obligation to reverence, love and serve its Creator; but as soon as the mind should take in distinctly the conception of God as the Author of its being, and as possessed of every adorable attribute, the duties arising out of this newly-discovered relation would be felt to be obligatory. A just consideration of this relation would lead to the conclusion that in every thing the will of such a Being standing in such a relation to the creature should be obeyed. Thus the important principle would be learnt, that the will of God, so far as made known by reason or revelation, should be the supreme rule of moral conduct. Conscience, henceforth, would act under the influence of this truth. And making the will of God—so far as made known—the supreme and only rule of moral conduct, would not be found at all inconsistent with the obligation to obey the dictates of conscience; for it would now become evident that God, being the author of our minds, had constituted them with this moral faculty, to admonish them of duty, so that the dictates of an enlightened conscience are the clear indications of the law or will of God. It is the law written on the hearts of all men.

Nothing can be considered as partaking of the nature of virtue which does not meet with the approbation of the moral faculty. This will by some be thought a dangerous principle, merely from a misapprehension of its nature. They allege, that the will of God is the only perfect and immutable standard of moral rectitude. They allege, moreover, that to define virtue to be only such actions as the moral faculty in man approves, is to make it a very uncertain and fluctuating thing, depending on the variable and discrepant moral feelings of men.

This objection confounds two things which should be kept distinct, viz. the quality of an object and the light or medium through which it is viewed. The colour of an object can be perceived only by the eye; but in order to have the object fairly before the eye, there must be light reflected from it, and that light on entering the pupil must be refracted so as to be conveyed to a focus on the retina. But without an eye it would be useless to descant ever so long or learnedly on the nature of colours, or the laws by which light is reflected and refracted. In the case of sight, it is evident that all the perception which is experienced must be by the eye. If the light is insufficient, it must be increased, and if any cause hinders it from being duly refracted, vision will not take place; but still it is only by the eye that we can have any perception of colours.

Perhaps an illustration, drawn from the faculty of taste, may be more appropriate. A beautiful landscape is presented; we are charmed with its beauty. This emotion or feeling of the beautiful depends on the faculty of taste. If that were absent, we might see all the objects as they stand, and perceive nothing of the beautiful. Beauty in the works of nature or art can be perceived only by taste, and the emotion will depend on the perfection of the faculty, provided the object is presented in a favourable light. A person of cultivated taste sees beauties where a rude savage sees none. Thus also in regard to moral acts, or a connected series of moral actions, every idea and feeling of a moral kind must as necessarily be through the moral faculty as colours through the organ of vision. We have no other faculty which takes cognisance of moral qualities. The judgments and emotions which are produced by the contemplation of such actions are always infallibly correct, when the mind is duly enlightened and the faculty itself in a sound and healthy state. There is no inconsistency between this

opinion and that which considers the will of God as the real standard and ultimate rule of moral conduct.

For, as has been shown, although conscience can act within a narrow sphere without even the knowledge or belief of a God; yet so soon as this knowledge is obtained, and the mind recognises its relation to its Creator, a new field is opened for the operations of conscience. It is soon perceived, that the clear dictates of conscience, in cases of self-evident truth, are nothing else than the indication of the law of God written on the heart of every man, as was before explained. We can refer to the will of God as a rule of moral conduct in no other way than by the exercise of the moral faculty, by which it is clearly perceived that our Creator and Preserver has a just claim on our obedience, and ought in all things to be obeyed. But if conscience did not thus dictate, all appeals to the will of God to show what is morally right would be in vain. The certainty and immutability of our moral standard of rectitude will then be in proportion to the knowledge which the mind possesses of the existence of God and the creature's relation to Him. Instead, therefore, of making our moral feelings mere instinctive emotions, as is done by Hutcheson and Shaftesbury, we make them depend on the clear dictates of the understanding; for, as we have often explained, the judgments of conscience are no other than the understanding judging on moral subjects.

LESSONS IN READING AND ELOCUTION.

No. XXIII.

RELIGION THE GUARDIAN OF THE SOUL.

One of the circumstances of our moral condition is danger. Religion, then, should be a guardian, and a vigilant guardian; and let us be assured that the Gospel is such. Such emphatically do we need. If we cannot bear a religion that admonishes us, watches over us, warns us, restrains us; let us be assured that we cannot bear a religion that will save us. Religion should be the keeper of the soul; and without such a keeper, to the slow and undermining process of temptation, or amidst the sudden and strong assaults of passion, it will be overcome and lost.

Again the human condition is one of weakness. There are weak points, where religion should be stationed to support and strengthen us. Points, did I say? Are we not encompassed with weakness? Where, in the whole circle of our spiritual interests and affections, are we not exposed and vulnerable? Where have we not need to set up the barriers of habit, and to build the strongest defences with which resolutions, and vows, and prayers can surround us? Where, and wherein, I ask again, is any man safe? What virtue of any man is secure from frailty? What strong purpose of his, is not liable to failure? What affection of his heart can say, "I have strength, I am established, and nothing can move me?"

How weak is man in trouble, in perplexity, in doubt;—how weak in affliction, or when sickness bows the spirit, or when approaching death is unloosing all the bands of his pride and self-reliance! And whose spirit does not sometimes faint under its *intrinsic* weakness, under its *native* frailty, and the burthen and pressure of its necessities? Religion, then, should bring supply, and support and strength to the soul; and the Gospel does bring supply, and support and strength. And it thus meets a universal want. Every mind *needs* the stability which principle gives; needs the comfort which piety gives; needs it continually, in all the varying experience of life.—*Orville Dewey.*

STUDY OF HUMAN NATURE ESSENTIAL TO A TEACHER.

If you were about to engage in a capacity higher than that of a day labourer, in any other pursuit than that of teaching, would you not set yourself at once to understand what was the object which you should endeavour to have in view, and what the machinery by which you could attain it? If you were going to manufacture woollen goods, you would wish to understand the nature of the raw material, the processes and machinery by which it is to be acted on, and to judge of the quality of the article you wished to produce. Will you do less, when the mechanism with which you are to operate is the work of an Infinite Architect? and the web to be woven is the rich and varied fabric of human character?

If you were about to engage in agriculture, you would take care to inform yourself as to the nature of the soil, its adaptation to the various kinds of grain and vegetables, and the season of the year at which, in this climate, it is most proper to prepare the ground, to plough, to sow the seed, and to reap and gather into the barn. Will you take less care, when the soil is the human soul, the seed is the word of life, the harvest, the end of the world, and the reapers, angels?

If you were going to navigate the ocean, you would wish to know how to judge of the ship, to sail and steer; you would inquire about the currents that would set you from your course, and the winds that should bear you onward; you would learn to trace the moon's course among the stars, and to look aloft to the sun in his path, that you might not drift at random on the broad sea, but speed towards your desired haven, as if you could see it rising before you above the blue waves. So much you would do that you might convey in safety a few tons of merchandise; and all men would hold you unwise if you did less. Shall they not tax you with worse than folly, if you make less preparation when your ship is the human soul, freighted with a parent's and a nation's hopes,—with the hopes of immortality,—if you fail to study the currents of passion, to provide against the rocks of temptation, and to look aloft for the guiding light which shines only from Heaven.

But, to speak without simile, the study of mental philosophy is of the greatest importance to a teacher in every point of view. If we would exercise the several powers, we must know what they are, and by what discipline they are to be trained. If we would cultivate them harmoniously, in their natural order and proportion, we must know which of them first come into action, which are developed at a later age, and what are the province and functions of each. Without this knowledge, we can hardly fail of losing the most propitious times for beginning their cultivation; we shall make the common mistake of attempting certain studies too soon, or we shall make use of means little suited to the ends we have in view.

Important as this study is, it is no more difficult than any other, if, in regard to it, we take the same course which we find the true one in other investigations,—if, laying aside conjectures, dreams and speculations, we adopt the safe and philosophical rule, to observe the facts carefully and extensively, and draw from them only their legitimate conclusions.

There are three sources from which we are to draw light; first, the facts of our own consciousness, the most difficult of all to consult; secondly, the facts we observe in the mental growth of others, especially of children; and lastly, the great storehouse of recorded facts contained in the works of those, who, directly or indirectly, have written upon this subject.—*G. B. Emerson.*

THE STAGE.

Lo, where the Stage, the poor, degraded Stage,
Holds its warped mirror to a gaping age;
There,—where, to raise the drama's moral tone,
Fool Harlequin usurps Apollo's throne;
There,—where grown children gather round to praise
The new-vamped legends of their nursery days;
Where one loose scene shall turn more souls to shame,
Than ten of Cumming's lectures can reclaim;
There,—where in idiot rapture we adore
The herded vagabonds of every shore;
Women, unawed, who, lost to women's pride,
The drunkard's stagger ape, the bully's stride;
Pert, lisping girls, who, still in childhood's fetters,
Babble of love, yet barely know their letters;
Neat-jointed mummers, mocking nature's shape,
To prove how nearly man can match an ape;
Vaulters, who, rightly served at home, perchance
Had dangled from the rope on which they dance;

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Dwarfs, mimics, jugglers, all that yield content,
Where Sin holds carnival, and Wit keeps Lent;
Where, shoals on shoals, the modest million rush,
One sex to laugh, and one to try and blush,
When mincing Ravenot sports tight pantalettes,
And turns fops' heads while turning pirouettes;
There, at each ribald sally, where we hear
The knowing giggle and the scurrile jeer,
While from the intellectual gallery first
Rolls the base plandit, loudest at the worst.
Gods! who can grace yon desecrated dome,
When he may turn his Shakspeare o'er at home?
Who there can group the pure ones of his race,
To see and hear what hids him veil his face?
Ask ye who can? why, I, and you, and you;
No matter what the nonsense, if 'tis new.
To Dr. Logic's wit our sons give ear;
They have no time for Hamlet, or for Lear;
Our daughters turn from gentle Juliet's woe,
To count the twirls of Almaviva's toe.
Not theirs the blame who furnish forth the treat,
But ours, who throng the board, and grossly eat.
We laud, indeed, the virtue-kindling Stage,
And prate of Shakspeare and his deathless page;
But go, announce his best, on Cooper call,
Cooper, "the noblest Roman of them all;"
Where are the crowds so wont to choke the door?
Tis an old thing, they've seen it all before.
Pray Heaven, if yet indeed the Stage must stand,
With guiltless mirth it may delight the land;
For better also each scenic temple fall,
And one approving silence curtain all.
Despots to shame may yield their rising youth,
But Freedom dwells with purity and truth.
Then make the effort, ye who rule the Stage,—
With novel decency surprise the age;
Even Wit, so long forgot, may play its part,
And Nature yet have power to melt the heart;
Perchance the listeners, to their instinct true,
May fancy common sense,—'twere surely Something New.—*Charles Sprague.*

EDUCATION.

[From an Inaugural Address delivered at a College.]

Convened as we are this day, in the portals of science and literature, and with their arduous heights, and profound depths, and Elysian fields before us, *education* offers itself as the inspiring theme of our present meditations. This, in a free, enlightened, and Christian state, is confessedly a subject of the highest moment. How can the diamond reveal its lustre from beneath incumbent rocks and earthly strata? How can the marble speak, or stand forth in all the divine symmetry of the human form, till it is taken from the quarry, and fashioned by the hand of the artist? And how can man be intelligent, happy, or useful, without the culture and discipline of education?

It is this that smooths and polishes the roughnesses of his nature. It is this that unlocks the prison-house of his mind, and brings out the captive. It is the transforming hand of education which is now, in so many heathen lands, moulding savageness and ignorance, pagan fanaticism and brutal stupidity, revenge, and treachery, and lust,—and, in short, all the warring elements of our lapsed nature, into the various forms of exterior decency, of mental symmetry, and of Christian loveliness. It is education that pours light into the understanding, lays up its golden treasures in the memory, softens the asperities of the temper, checks the waywardness of passion and appetite, and trains to habits of industry, temperance, and benevolence. It is this which qualifies men for the pulpit, the senate, the bar, the art of healing, and the bench of justice. It is to education, to its domestic agents, its schools and colleges, its universities and literary societies, that the world is indebted for a thousand comforts and elegancies of civilised life, for almost every useful art, discovery, and invention.

In a word, education, regarding man as a rational, accountable, and immortal being, elevates, expands, and enriches his mind; cultivates the best affections of his heart; pours a thousand sweet and gladdening streams around the dwellings of the poor, as well as the mansions of the rich; and while it greatly multiplies and enhances the enjoyments of time, helps to train up the soul for the bliss of eternity.—*Dr. Humphrey.*

LESSONS IN ARITHMETIC.—No. XXXIII.

PERCENTAGE.

The terms *Percentage* and *Per Cent.* signify a certain *allowance on a hundred;* that is, a certain *part* of a hundred, or simply *hundredths.* Thus, the expression 6 per cent. signifies 6 hundredths ($\frac{6}{100}$), 7 per cent., 7 hundredths ($\frac{7}{100}$), etc., of the number or sum of money under consideration.

Note.—The terms *Percentage* and *Per Cent.* are derived from the Latin *per* and *centum*, signifying *by the hundred.*

We have seen that *hundredths* are *decimal* expressions, occupying the first two places of figures on the right of the decimal point. Now, since *percentage* and *per cent.* signify *hundredths*, it is manifest that they can be expressed by decimals, as in the following

PERCENTAGE TABLE.

1 per cent.	...	...	is written thus:	·01
2 per cent.	...	...	,, ,,	·02
3 per cent.	...	...	,, ,,	·03
6 per cent.	...	...	,, ,,	·06
7 per cent.	...	...	,, ,,	·07
10 per cent.	...	...	,, ,,	·10
12 per cent.	...	...	,, ,,	·12
50 per cent.	...	...	,, ,,	·50
100 per cent.	...	...	,, ,,	1·00
103 per cent.	...	...	,, ,,	1·03
125 per cent., etc.	...	...	,, ,,	1·25
$\frac{1}{2}$ per cent., that is, $\frac{1}{2}$ of 1 per cent.			,, ,,	·005
$\frac{1}{4}$ per cent., that is, $\frac{1}{4}$ of 1 per cent.			,, ,,	·0025
$\frac{3}{4}$ per cent., that is, $\frac{3}{4}$ of 1 per cent.			,, ,,	·0075
$13\frac{1}{8}$ per cent.	...	...	,, ,,	·13125
$25\frac{3}{4}$ per cent.	...	...	,, ,,	·25375

Obs.—1. It will be seen from the preceding Table, that when the given percentage is *less* than 10, a cipher must be prefixed to the figure expressing it.

When the given percentage is *more* than 100, it must plainly require a mixed number to express it.

2. Parts of 1 per cent. may be expressed by a *common* fraction, or by *decimals.* Thus, the expression $17\frac{1}{4}$ per cent., is equivalent to ·17625 per cent.

3. The *first two* decimal figures properly denote *per cent.*, for they are *hundredths;* the other decimals being *parts of hundredths*, express *parts* of 1 per cent.

EXAMPLES.

1. Write 1 per cent., 2 per cent., 4 per cent., 6 per cent., 7 per cent., 8 per cent., in decimals.
2. Write 11 per cent., 12, 14, 15, 16, 23, 65, 93.
3. Write $\frac{1}{2}$ per cent., $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{1}{16}$, $\frac{3}{16}$, $\frac{5}{16}$, $\frac{7}{16}$, $\frac{9}{16}$, $\frac{11}{16}$, $\frac{13}{16}$, $\frac{15}{16}$.
4. Write $4\frac{1}{2}$ per cent., $6\frac{1}{4}$, $7\frac{1}{8}$, $9\frac{1}{2}$, $12\frac{1}{2}$, $16\frac{1}{4}$, 115, $400\frac{1}{8}$.
5. An agent collected £700 for a merchant, and received 5 per cent. for his services: how much did he receive?

Analysis.—Since 5 per cent. is the same as $\frac{5}{100}$, the agent must have received $\frac{5}{100}$ of £700. Now $\frac{5}{100}$ of £700 is £$\frac{700}{20}$, which is equal to £7; and 5 hundredths is 5 times £7, or £35.

Operation.

£700		Since $\frac{5}{100} = .05$, we multiply the given number of pounds by ·05, and it gives the answer.
·05		
£35·00	Ans.	

Hence, to calculate percentage on any number, or sum of money,

Multiply the given number or sum by the given percentage expressed decimally; and point off the product as in multiplication of decimal fractions.

Obs.—1. It is important for the learner to observe, that the *amount* of money *collected* is made the *basis* upon which the percentage is computed. That is, the agent is entitled to 3 pounds as often as he *collects* 100 pounds, and *not* as often as he *pays over* 100 pounds, as is frequently supposed. For in the latter case he would receive only $\frac{3}{103}$, instead of $\frac{3}{100}$ of the sum in question. This distinction is important, especially in calculating percentage on large sums.

2. Hence, if the percentage contains a vulgar fraction which cannot be expressed decimally, first multiply by the decimal, then by the vulgar fraction of the given percentage, and point off the sum of their products as above.

8. What is 4½ per cent. of £300?

Solution.—Expressed decimally, 4½ per cent. = ·042; and £300 × ·042 = £12·60 = £12 12s. Ans.

7. What is 3 per cent. of £258 5s.?
8. What is 2 per cent. of £437 12s. 6d.?
9. What is 2½ per cent. of £138 7s. 6d.?
10. What is 6 per cent. of £146 3s.?
11. What is 7 per cent. of £1,630 10s.
12. A man borrowed £160, and paid 7 per cent. for the use of it: how much did he pay?
13. A merchant bought goods amounting to £1,825, and sold them so that he gained 12 per cent.: how much did he gain?
14. A person collected £862 10s. 8d., and charged 6 per cent. for his services: how much did he receive, and how much did he pay over?
15. What is 10 per cent. of £4,020 10s.?
16. What is 8 per cent. of £1,675?
17. What is 4½ per cent. of £725?
18. What is 5½ per cent. of £648 6s. 8d.?
19. What is 8½ per cent. of £1,000?
20. What is 7½ per cent. of £2,000?
21. What is 8¾ per cent. of £100 5s.?
22. A farmer having 1,500 sheep, lost 25 per cent. of them: how many did he lose?
23. A merchant having £1,960 on deposit, drew out 20 per cent. of it: how much had he left in the bank?
24. A merchant imported 1,500 boxes of oranges, and 12½ per cent. of them decayed: how many boxes did he lose, and how many had he left?
25. What is ⅛ per cent. of £1,625?
26. What is ¼ per cent. of £2,626 8s.?
27. What is ½ per cent. of £42,260 1s. 8d.
28. What is ¼ per cent. of £75,000?
29. What is ⅛ per cent. of £100,000?
30. What is ⅛ per cent. of £45,241 4s.
31. What is ⅛ per cent. of £675,264?
32. A merchant bought a stock of goods amounting to £4,565, and paid 3½ per cent for freight: what was the whole cost of his goods?
33. A man's salary is £200 a year, and he lays up 37½ per cent. of it: how much does he spend?
34. A youth who inherited £2,000 spent 40 per cent. of it in dissipation: how much had he left?
35. Two merchants embarked in business with £1,825 capital apiece; one gained 20 per cent. and the other lost 20 per cent. the first year: what was then the amount of each man's property?
36. Two men invested £1,000 apiece in stocks; one lost 8 per cent., the other 8 per cent.: what was the difference of their loss?
37. What is the difference between 8 per cent. of £1,040, and 7 per cent. of £905?

Applications of Percentage.

Percentage, *or the method of reckoning by hundredths*, is applied to various calculations in the practical concerns of life. Among the most important of these are Commissions, Brokerage, the Rise and Fall of Stocks, Interest, Discount, Insurance, Profit and Loss, Duties, and Taxes. Its principles, therefore should be thoroughly understood by every one.

COMMISSION, BROKERAGE, AND STOCKS.

Commission is the percentage or sum charged by agents for their services in buying and selling goods, or transacting other business.

Obs.—An Agent who buys and sells goods for another, is called a Commission Merchant, a Factor, Broker, or Correspondent.

Brokerage is the percentage or sum charged by money dealers, called Brokers, for negotiating Bills of Exchange, and other monetary operations, and is of the same nature as Commission.

By the term *Stocks*, is meant the *capital* of moneyed institutions, as incorporated Banks, Railway and Insurance Companies, etc.; also Government and Foreign Bonds, etc.

Obs.—1. Stocks are divided into portions of various sums, each, called *shares*; and the owners of these shares are called *shareholders*.

2. The association or company thus formed is called a *corporation*, when it has obtained a charter, instrument specifying the powers, rights, and privileges invested in the company.

The original cost or valuation of a share is called its nominal or *par* value; the sum for which it can be sold is its *real* value.

Obs.—1. The rise or fall of Stocks or Shares is reckoned at a certain percentage of its *par* value. The term *par* is a Latin word, which signifies *equal*, or a *state of equality*.

2. When Stocks sell for their original cost or valuation, they are said to be *at par*; when they sell for more than the cost price, they are said to be *above par*, *at a premium*, or an advance; when they do not sell at cost price, they are said to be *below par*, or *at a discount*.

3. Persons who deal in Stocks and Shares are usually called Stock and Share Brokers or Jobbers, according as they buy and sell for others, or on their own account.

The commission or allowance made to factors and brokers, and the rise and fall of stocks, are usually reckoned at a certain percentage on the amount of money employed in the transaction, or on the *par* value of the given shares. Hence,

To compute commission, brokerage, and the premium or discount on stocks,

Multiply the given sum by the given percentage expressed in decimals, and point off the product as in Percentage.

Obs.—The commission for the collection of bills, taxes, etc., and for the sale or purchase of goods, varies from 2½ to 12 or 16 per cent., and should always be reckoned on the *amount* of money *collected*, or paid out or employed in the transaction.

The brokerage for the sale or purchase of stocks varies from ⅛ to ¾ per cent., reckoned on the par value of the stock.

Examples.

1. An auctioneer sold goods amounting to £483, at 3 per cent. commission: how much did he receive?
2. An agent bought goods amounting to £626 6s. 6d.: what is his commission at 2 per cent.?
3. What is the commission on £1,682 5s. at 3½ per cent?
4. What is the commission on £1,463 10s. at 5 per cent.?
5. What is the commission on £2,660 7s. at 4½ per cent.?
6. What is the commission on £10,250 at 6 per cent.?
7. What is the commission on £8,340 6s. at 7 per cent.?
8. What is the commission on £960 8s. 3d. at 5½ per cent.?
9. A commission merchant sold goods to the amount of £8,235 at 2½ per cent.: what was his commission?
10. An attorney collected a debt of £8,265 17s. 6d., and charged 7½ per cent. for his services: how much did he receive?
11. Bought £1,108 worth of books at 4 per cent. commission: what was the amount of commission?
12. A tax-gatherer collected £1,225, for which he was entitled to 6½ per cent. commission: how much did he receive?
13. Sold goods amounting to £1,432 2s. 6d.: how much was the commission at 4 per cent.?
14. A commission merchant sold a quantity of hardware amounting to £924 7s. 6d.: how much would he receive,

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allowing 2½ per cent. for selling and 2 per cent. more for guaranteeing the payment?

15. An auctioneer sold carpeting amounting to £213 6s. 3d., and charged 2½ per cent. for selling and 2½ per cent. for guaranteeing the payment: how much did the auctioneer receive, and how much did he remit the owner?

Commission merchants, agents, etc., generally keep an account with their employers, and as they make investments or sales of goods, charge their commission on the amount invested or the sum employed in the transaction.

Sometimes, however, a specific amount is sent to an agent or broker, requesting him, after deducting his commission, to lay out the balance in a certain manner.

16. A gentleman sent his agent £1,500 to purchase a library: how much had he to lay out after deducting his commission at 5 per cent.; and what was his commission?

Note.—The money actually laid out by the agent in books is manifestly the proper basis on which to calculate his commission; for it would be unjust to charge commission on the sum he retains.

Analysis.—The money laid out is $\frac{100}{100}$ of itself, and the commission is $\frac{5}{100}$ of this sum; consequently the money laid out added to the commission must be $\frac{105}{100}$ of the whole amount. The question therefore resolves itself into this: £1,500 is $\frac{105}{100}$ of what sum? If £1,500 is $\frac{105}{100}$, $\frac{1}{105}$ must be $1500 \div 105 = \frac{100}{7}$, and $\frac{100}{7} = \frac{100}{147} \times 100 = £1,428{\cdot}57$, the sum laid out. Now £1,500 − £1,428·57 = £71·43, = £71 8s. 7½d. the commission.

Proof.—£1,428·57 × ·05 = £71·43; and £1,428·57 + £71·43 = £1,500, the amount sent. Hence,

To compute commission when it is to be deducted in advance from a given amount, and the balance is to be invested,

Divide the given amount by £1 increased by the per-centage commission, and the quotient will be the part to be invested. Subtract the part invested from the given amount, and the remainder will be the commission.

Obs.—The commission may also be found by multiplying the sum invested by the given per-centage according to the preceding rule.

17. An agent received £2,150 to lay out in provisions, after deducting 2 per cent. commission: what sum did he lay out?

18. A country dealer sent £356 to his agent in the city to purchase goods: after taking out his commission, at 3½ per cent., how much remained to be laid out?

19. Baring, Brothers, and Co. sent their agents £80,000 to buy flour: after deducting 5 per cent. commission, how much would be left to invest?

20. A broker negotiated a bill of exchange of £82,531, at 5 per cent.: how much did he receive for his services?

21. What is the brokerage on £94,265 at 1½ per cent.?

22. What is the brokerage on £6,200 at ¾ per cent.?

23. What is the brokerage on £8,845 10s. at ¼ per cent.?

24. What is the brokerage on £2,500 at ⅛ per cent.?

25. A broker made an investment of £21,265, and charged 1½ per cent.: what was the amount of his brokerage?

26. If you buy 20 £100 shares in the Great Western Railway at 7 per cent. premium, how much will they cost you?

Ans. £2,140.

Note.—The shares evidently cost their par value, which is £2,000, and 7 per cent. besides. Now £2,000 × ·07 = £140; and £2,000 + £140 = £2,140.

27. What is the cost of 20 shares of Bank stock at 7 per cent. discount? Ans. £2,000 − £140 = £1,860.

28. What is the cost of 35 £100 shares in the London and North-western Railway at 5½ per cent. premium?

29. A merchant bought 45 shares in the London Joint-Stock Bank at par, and afterwards sold them at 50 per cent. discount: how much did he lose?

30. A man invested £846 in the Three per Cent. Consols, and afterwards sold out at 4½ per cent. premium: how much did he sell his stock for?

31. Sold 64 £100 shares in the Midland Railway at 10½ per cent. premium; how much did they come to?

32. A man bought 35 shares in the Great Northern Railway at par, and afterwards sold them at 1½ per cent. premium; how much did he get for them?

33. A man bought 15 £100 shares in the South-eastern Railway at 2 per cent. premium, and sold them at 10 per cent. discount; how much did he sell them for, and how much did he lose?

34. Bought 71 £100 shares in the Central Gas Consumers' Company at 5½ per cent. premium: how much did they amount to?

35. A broker bought 48 shares in the Leeds and Northern Railway at 14 per cent. discount, and sold them at 6 per cent. premium: how much did he make by the operation?

36. If I employ a broker to buy me 55 £100 shares in the Great Eastern Railway, which are 20 per cent. below par, and pay him ½ per cent. brokerage, how much will my shares cost me?

37. If my agent buys 78 £100 shares in the North Midland Railway at 15 per cent. premium, and charges me ¾ per cent. brokerage, how much will my stock cost?

LESSONS IN GREEK.—No. LIV.

By John R. Beard, D.D.

The Enlargement of Simple Sentences.

We have considered simple sentences viewed in their Greek construction. We now pass on to consider compound sentences. In order to do so with effect, we must attend to the enlargement of simple propositions. Every word not necessary to the utterance of a proposition may be accounted an enlargement of a sentence. Every part of a sentence admits of enlargement. The subject may be enlarged; the predicate may be enlarged. The subject and the predicate may be enlarged both externally and internally.

The external enlargement of the subject consists in this, that the affirmation made in the predicate is equally referred to several different objects, so that there are several subjects belonging to one predicate. Now several subjects to which one predicate is assigned, may be viewed as a series of connected individual persons or things, or they may be viewed as forming a whole. If these subjects form a series they are united together copulatively by *καὶ*, *τε—καὶ*, *τε—τε*, *καὶ—καὶ*, or disjunctively by *ἤ*. In English the copulative and the disjunctive are ordinarily placed only before the last noun of the series; in Greek they are placed between every two of the series. If the series is viewed as a whole the one is added to the other by means of *σὺν*, *μετὰ*, *ἅμα*.

The subject must agree with the predicate. This general rule may be expanded.

The predicate may agree with the several nouns in the plural or dual number, on the ground that in sense the several nouns are comprehended in the affirmation made in the predicate; or the predicate may grammatically agree with one of the nouns, with which in sense it is more intimately connected than with any other or all the others; that intimate connection may arise from proximity. In the former case the predicate will be in the plural, in the latter case it will be either in the singular or the plural, according to the number of the noun with which it is immediately connected. When the predicate agrees with only one noun, it must be understood to apply to the others through that one noun or subject.

In reference to several subjects which signify things without life or conditions of things, the Greeks commonly put the adjective predicate in the neuter plural. In reference to masculine and feminine subjects, the common adjective predicate or attribute is usually in the masculine gender.

In the union of several grammatically different subjects, the verb either agrees with the nearest, or is in the plural; if one of the subjects is in the first person, the verb is in the first person. Instances of these constructions will be found in the exercise. In some cases I have given the same sense in different modes of expression. The sense may in these cases be said to be generally the same. Nevertheless, shades of difference appear to the practised scholar. The laws of thought are more imperative, as well as more various, than the rules of grammar. By the laws of thought the rules of grammar are

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constantly modified, nor is it possible to reduce to grammatical rule the nicer distinctions of thought. You must, therefore, in your grammatical studies make due allowance for the predominance of the thought over the expression. No two forms of utterance can well be nearer in sense than these—

Συ τε Ἕλλην εἶ και ἡμεῖς
Thou art a Greek and we (are Greeks).
Ἕλληνες ἐσμὲν και συ και ἡμεῖς
We are Greeks both thou and we.

Yet they slightly differ; for in the former και ἡμεῖς seems to be added as an after-thought, and as if in the way of a claim; whereas in the latter, both subjects are at once and frankly owned as Greeks, and emphasis is given to the acknowledgement by the addition of και συ και ἡμεῖς.

Observe that subjects connected disjunctively, as well as conjunctively take a plural verb in Greek. This usage is contrary to what is common in English. Observe also, that a noun singular having a plural united with it by a preposition, and so forming a compound subject, takes the verbs in the plural in the Greek. Here also we have a departure from the rule of English grammar.

The internal enlargement of the subject consists in this, that an attribute is associated with it. By an attribute is meant any addition made to a substantive, which serves to individualise the substantive, that is, to describe its essence and nature, and to distinguish it from other of the same species. The attribute appears as blended with the subject by means of an adjective; thus we say—

καλη γυνη	γυνη μεγαλη	αριστη γυνη
a fair woman	a great woman	an excellent woman.

The attribute is blended with the subject by means of a genitive, or a preposition with its case, or in virtue of combination; *e.g.*

οἶκος πατρος	οἶκος ἐν τῃ πολει	οἰκοδομη
father's house	house in the city	house-building.

The attribute may also be set forth as something subjoined in the way of explanation; as

οἶκος, ἡ των ανθρωπων μονη
house, the dwelling-place of men.

This application of the attribute is specifically called apposition.

Attributes may be assigned to nouns not merely as subjects but also as objects.

In Greek frequently nouns may perform the office of attributives. Thus we may employ these uncoalescing combinations—*ανηρ πρεσβυτης, an old man*; *ανηρ νεανιας, a young man* (literally *a youth-man*); *γραῦς γυνη, an old woman*; *πρεσβῦτις γυνη, an old woman*. We may exhibit the fact thus—

ανηρ—πολιτης, τυραννος, οπλιτης, ἱππευς, αρχης, βουληφορος.
ανθρωπος—μετοικος, τεχνιτης, ῥητωρ, φιλοσοφος, ενεργετης, etc.
ανηρ—Ἀθηναῖος, Σπαρτιατης, Περσης, Πυγμαίος.
γυνη—Σπαρτιατις, Περσις; το ταμιη, δεσποινα.

To these and other adjectives of race or country, *ανηρ* and *γυνη*, are thus added as attributives. Thus, in English we say, a French man, an English woman. In a similar manner, to the names of lands, islands, mountains, and especially rivers, may be added the appellative,[a] descriptive of the species, when the proper name and the appellative are of the same gender; *e.g.*—Ὁ *Μαιανδρος ποταμος, the river Mæander*; ὁ *Εὐφρατης ποταμος*; ἡ *Θεσπρωτις γῆ*; ἡ *Αττικη γῆ* (or χωρα); ἡ *Δηλος νησος*; το *Σουνιον ακρον*; τα *Κεραυνια ὀρη*. Observe that the Greeks said *the island Delos*, which is more logically correct than our "the island of Delos."

[a] An appellative is a common noun or name of a species, in distinction from a proper noun, or name of an individual.

Also adverbs and adverbial phrases may be connected with a noun as its attribute, when the noun has the article. This is a marked peculiarity, and I shall therefore place the instances with their meanings in a distinct and emphatic manner.

Adverbial Attributes.

ἡ *ανω πολις*, the upper (lying island) city.
αἱ *πλας κωμαι*, the neighbouring towns.
ὁ *μεταξυ χρονος*, the interval, the meanwhile.
ὁ *επειτα χρονος*, the following time, afterwards.
ἡ *εν Μαραθῶνι μαχη*, the battle on the plain of Marathon.
ἡ *εν Σαλαμῖνι ναυμαχια*, the naval battle at Salamis.
ἡ *σφοδρα επιθυμια*, the intense desire.
Περικλῆς ὁ *παυυ*, the great Pericles.

The attributive adjective agrees with the subject to which it belongs, in the same way as the predicate agrees with its subject, following the subject in gender, number, and case, *e.g.* *σοφος ανηρ, a wise man*; *γυνη καλη, a fair woman*; *τα ὑψηλα ὀρη, the lofty mountains*; *τῃ εμῃ θυγατρι, to my daughter*.

If several adjective attributes are joined with a noun they are either connected together by means of και, τε—και, etc.; or they stand without a copula. Adjectives expressive of quality are generally united by και, etc., *e.g.*

Νεα και ἁπαλη σαρξ, young and tender flesh.
Αγαθῶν και παλαιων νομοθετῶν ευρηματα, the discoveries of good and ancient lawgivers.
Μεγαλα και λαμπρα δῶρα της τυχῆς, the good and brilliant gifts of fortune.
Οικια μεγαλη και ευδαιμων, a great and happy family.
Γυνη καλη και ευειδης, a fair and well formed woman.

The copula may be omitted, however, if one of the adjectives blends with the noun so as to form with it a compound idea, as *εσχατη κακη τυχη, the extreme of bad luck*; where *κακη τυχη* go together as if they were one word; so *μεγα πλοῖον σιταγωγον, a large corn-vessel*. The copulative και is sometimes omitted also for the sake of oratorical effect.

Equally disconnected are the adjective attributes if one of them is a pronominal adjective, or an adjective of number or quality, as *σον εργον λαμπρον, thy splendid deed*; *δεκα νῆες μακραι, ten long ships*; *αλλος νεος παῖς, another young child*; *δικαῖος ανηρ ουδεις, not one just man*. Πολυς forms an exception; thus, πολλοι και καλοι χιτωνες (though in English the conjunction is here omitted), *many beautiful coats*; αλλοι πολλοι και σοφοι ανδρες, *many other wise men*.

If you subjoin an attribute which arises out of the nature of the subject, and yet has an independent existence, you form what is called apposition, that is, the ascription of two (or more) ideas to the same subject. Explanation is the object of this construction. It has special force to give individuality to the subject, distinguishing it from others with which it might be confounded. The word receiving the apposition determines the case of the word by which the apposition is made. In general, the latter immediately follows the former. For the sake of special emphasis, however, the explanatory word may take precedence; *e.g.*

Ὁ κοινος ἰατρος θεραπευσει σε, χρονος, for
Χρονος, ὁ κοινος ἰατρος, θεραπευσει σε
Time, the common physician, will heal thee.

The personal pronouns and the demonstrative pronouns, whether used substantively or adjectively, may receive apposition. The personal pronoun involved in the verb may also receive apposition.

If a preposition is employed with the chief word, it is commonly not repeated with the subordinate one.

Special notice must be given to apposition with possessive pronouns, and adjectives which indicate that something belongs to an object. In these instances the appended words are in the genitive; the case being taken from the genitive force of the word which represents possession. Let us give an instance:

Διαρπαζουσι τα εμα τον κακοδαιμονος
They plunder my goods, wretched man that I am;

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where the genitive *τον κακοδαιμονος* is borrowed from the genitive involved in *εμα*; and the phrase is equivalent to *διαρπαζουσι τα του κακοδαιμονος εμου πραγματα, they plunder the goods of me, a wretched man.* In rendering the idiom into English, some latitude must be taken, in order to make the sense clear.

Another kind of apposition is, that in which the parts of a whole are appended to the whole in the same case as the whole itself, has, *e.g.*

Λῦπαι αἱ μεν χρηστα ισιν, αἱ δε κακαι
(Of) griefs some are useful, others bad.

In English the whole is put in the objective, but in Greek the whole stands in the same case as the parts. We have a somewhat similar construction in English, *e.g.—the pilgrims* returned *each* to his own home.

To this, which is called the partitive apposition, belongs the *σχῆμα καθ' ὁλον και μιρος*, that is, the construction which puts the part and the whole in the same case; a construction which strictly is peculiar to the poets; thus Homer says—

Τον μιν αρα Γλαῦκος στηθος μισον ουτασε δουρι
Him Glaucus, (in) *the centre of his bosom*, wounded with a spear;

where *στηθος μισον*, the part, is in apposition with *τον*, the whole; *στηθος μεσον* thus defines the exact place in which the man was wounded.

Sometimes the distributive apposition is connected with this partitive apposition; *e.g.*

Τρῶας δε τρομος αινος ὑπηλυθε γυῖα ἑκαστον
Dreadful fear seized the Trojans (in) each one's knees.

The infinitive appears in apposition, chiefly after demonstrative and relative pronouns, in order to give a more exact view of the idea before generally indicated; *e.g.*

Βαρος τι και τοδ' εστιν, αινεῖσθαι λιαν
This also is something unpleasant, (namely) to be praised excessively.

A substantive appears in apposition to an entire sentence, in order to mark the point of view from which the fact in the sentence is to be regarded; *e.g.*

Ἑλενην κτανωμεν, Μενελιῳ λυπην πικραν
Let us slay Helen—a bitter grief to Menelaus.

Exercises.—Greek-English.

*Των αντων διονται και ἡ γυνη και ὁ ανηρ, δικαιοσυνης και σωφροσυνης. Μινως και Λυκοῦργος νομους εθετην. Σωκρατει ὁμιλητα γινομενω Κριτιας τε και Αλκιβιαδης πλειστα κακα την πολιν εποιησατην. Εμελλον απολογησασθαι Αἰσχαρης ἡ Δικαιογενης. Δημοσθενης μετα των ξυστρατηγῶν σπενδονται. Αλκιβιαδης εκ Σαρδιων μετα Μαντιθεου ἱππων ευπορησαντες απεδρασαν ες Κλαζομενας. Εστρατηγει τῶν νεῶν Αριστευς και Καλλικρατης και Τιμανωρ. Ανιστατο εκ τοῦ συμποσιου ὁ Τιμαρχος και ὁ Φιλημων απεκτενοῦντες Νικιαν. Ηλθε Χρυσαντας τε ὁ Περσης και αλλοι τινες τῶν ὁμοτιμων. Βασιλινς και οἱ συν αυτῳ διωκων ιεχπιπτει εις το Κορῖνθιον στρατοπεδον. Αβεβαια και πλουτος και τιμη και δοξα. Σωματος καλλος και ισχυς διιλῳ και κακῳ ξυνοικοῦντα συ πριποντα φαινεται, αλλ' απριπῆ. Ευγενιαι και δυναμεις και τιμαι δηλα εστιν αγαθα οντα. Εκκλησιαζομεν περι πολιμου και ειρηνης, ἁ μεγιστην εχει δυναμιν εν τῳ βιῳ των ανθρωπων. Νιοι τε και νιαι ὁμιλοῦντες αλληλοις φιλοπονως ἡδεως διαγουσιν. Αλκηστις ἡθελησε μονη ὑπιρ ταῦ αὐτῆς ανδρος αποθανειν, ουτων αυτῷ πατρος τε και μητρος. Συ τε Ἑλλην εἰ και ἡμεῖς. Ἑλληνες ισμεν και συ και ἡμεῖς. Ουτε συ ουτ' αν αλλος ουδεις δυναιτ' αντειπεῖν. Ουτε συ αν δυναια αντειπεῖν ουτ' αλλος ουδεις. Και εγω και συ πολλα δη τοῦ αρισκειν ἑνεκα τῇ πολει και ειπομεν και επραξαμεν. Ὑμεῖς και εγω ταδε λεγομεν. Λακεδαιμονιοι και ἡμεῖς ουτε νομιμς ουτε ἑθεσι χρωμεθα τοῖς αυτοῖς. Πολλα και καλα ειργασαντο. Επισχυν πολλα και δεινα. Αμεινοκλῆς, Κορινθιος ναυπηγος, Σαμιοις ναῦς εποιησε. Κροῖσος, ὁ Λυδιος βασλευς, απιβαλε την αρχην. Σωκρατην, ανδρα σοφωτατον και δικαιοτατον, απεκτειναν οἱ Αθηναῖοι. Σκυθαι, βαρβαρον ἑθνος, ανδρεῖοι εισι και μαχιμοι. Μεγαλην, φασι, δυναμιν τῳ Γυγῃ, τοῦ Λυδοῦ προγονῳ, γενισθαι. Το μελος εκ τριῶν συγκειται, λογου τε και ἁρμονιας και ῥυθμου. Περι χρηματων λαλεῖς, αβεβαιου πραγματος. Ἡμεῖς, οἱ παλαιπωροι, απολωλαμεν. Οὑτος ὁ τροπος ἡν τῆς τῶν παλαιῶν φιλοσοφιας, βρακυλογια τις Λακωνικη. Θιμιστοκλῆς ἡκω παρα σε. Εκεινο κιρδανεῖν ἡγειται, την ἡδονην. Ταμα (τα εμα) δυστηνου κακη. Απιτε εφ' ὑμιτιραν των βαρβαρων χωραν. Αθηναῖος ὢν, πολεως τῆς μεγιστης και ευδοκιμωτατης. Οικιαι αἱ μεν πολλαι επιπτωκεσαν, ολιγαι δε περιῆσαν. Αἱ τεχναι το ἀντῆς ἑκαστη εργον εργαζεται. Παντες οἱ δημιουργοι βλεπουσι προς το ἑαυτον εργον ἑκαστος. Μιθες με χιφα. Τρῶας δε αχος ελλαβε θυμον. Παῖον σε επος φυγεν ἑρκος οδοντων! Αχαιοῖσιν δε μεγα σθενος εμβαλ' ἑκαστῳ καρδιῃ αλληκτον πολεμιζειν ηδε μαχισθαι. Εστι πενια αὐτη σαφης, το δεομενον τινος μη εχειν χρῆσθαι. Οἱ τα φαρμακα πινοντες ποτερον σοι δοκοῦσι τουτο βουλεσθαι, ὁπιρ ποιουσι, πινειν το φαρμακον και αλγεῖν, ἡ ἑκεινο, το ὑγιαινειν; Κισομεθα δι νικρῳ, αθανατον αλγος σοι, ψογος δε σῷ πατρι.

Vocabulary, Questions, etc.

Ξυστρατηγῶν for *συστρατηγῶν*, from *συν* and *στρατηγος*.

Ὁμοτῖμος (*ὁμος*, like, and *τιμη* honour), *alike honoured*; *οἱ ὁμοτιμοι*, were among the Persians the first class of citizens, *the nobility*; compare our word "peers," that is *pares*, equals. *Εργασαντο*, from *εραγζομαι*, I do, I make. *Απιτε εφ' ὑμιτεραν*, etc., the sentence may be resolved thus, *απιτε επι την χωραν ὑμων βαρβαρων, go away to the country of you barbarians*; that is, *beyone to your own country, you barbarians.* In a similar manner, resolve and explain the sentence beginning *Αθηναῖος ὢν.*

Παῖον σε επος, literally, *what a speech has escaped thee, the hedge of (thy) teeth*; that is, *what a speech has fallen from thy lips.*

Εθιτην, why is this verb in the active, not in the middle voice?

Εποιησατην, what part of the verb is this? what parts are the following? namely, *απολογησασθαι, ευπορησαντες, ανιστατο, ἡλθι, εκκλησιαζομεν, αποθανειν, αντειπεῖν, ζυναιο, επραξαμιν, ειργασαντο, γενισθαι, ἡγειται.*

Why is *σπενδονται* in the plural? Why is *εστρατηγει* in the singular? How do you explain that the fact *ανιστατο* is in the singular, and *απεκτενοῦντες* in the plural? Why is *φαινεται* in the singular? Why is *αγαθα οντα* in the neuter? Why is *ὁμιλουντες* in the masculine?

Explain the construction of *οντων*; also of *δυστηνου* and *των βαρβαρων*; also of *λογου τε και ἁρμονιας και ῥυθμου.*

What do you mean by apposition? State its several modifications.

Historical Anecdotes.

Επει ὁ Σωκρατης κριθεις το δικαστηριαν απελιπετο, και γσθετο τους παριπομενους φιλους δακρυοντας, Τί τοῦτο, εἰπεν, ἡ αρτι δακρυετε; συ γαρ παλαι ιστε ὁτι εξ ὁτου περ εγενομην, κατεψηφισμενος ἡν μου ὑπο τῆς φυσιως ὁ θανατος; αλλα μεντοι, ει μιν αγαθῶν επιῤῥεοντων προσαπολλυμαι, ἑηλεν ὁτι εμοι και τοις εμοις ενιοις λυπητεον, ει δε χαλιπῶν πραξδεκομενων καταλνω τον βιον, εγω μιν οιμαι ὡς ευπραγοῦντος εμοῦ πᾶσιν ὑμιν ενθυμητεον εἶναι. Παρων δε τις Απολλοδωρος επιθυμητης μιν ισχυρῶς αυτοῦ, αλλως δ' ευηθης, εἰπεν αρα, Αλλα ταῦτο εγωγε, ω Σωκρατες, χαλεπωτατα φιρω, ὁτ' ὀρῶ σι αδικῶς αποθνησκοντα. Τον δε λεγεται καταψησαντα την αυταῦ κιφαλην ειπεῖν, Συ δι, ω φιλτατε Απολλοδωρε, μαλλον αν εβουλου με ὁρᾶν δικαιως η αδικῶς αποθνησκοντα; και αμα επιγιλασαι. Λεγοντος δε τινος ὁτι αηδῶς εσθιοι. Ακουομενος, εφη, ταυτοα φαρμακον αγαθον

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διδασκειν. Ερομενου δε, Ποιον; Πανσασθαι ισθιοντα, εφη· και ηδιον τε και εντελεστερον και ὑγιεινοτερον φησι διαξειν πανσαμενον. Αλλου δε αῦ λεγοντος ὁτι θερμον εἰη παρ' ἑαυτῷ τε ὑδωρ, ὃ πινοι. Οταν αρ', εφη, βουλῃ θερμῳ λουεσθαι, ἑτοιμον εσται σοι. Αλλα ψυχρον, εφη, ὡστε λουεσθαι εστιν. Αρ' συν, εφη, και οι οικεται σου αχθονται πινοντες τε αυτο και λουομενοι αυτῳ; Μα τον Δι', εφ· αλλα και πολλαις τεθαυμακα ὡς ηδεως αυτῳ προς αμφοτερα ταῦτα χρῶνται. Ποτερον δε, εφη, το παρα σοι ὑδωρ θερμοτερον πωῦν εστιν η το εν Ασκληπιοῦ; Το εν Ασκληπιοῦ, εφη. Ποτερον δε λουεσθαι ψυχροτερον, το παρα σοι η το εν Αμφιαρου; Το εν Αμφιαρου, εφη. Ενθυμοῦ συν, εφη, ὁτι κινδυνευεις ὑσαρεστοτερος εἶναι των τε οικετων και των αρρωστουντων.

Vocabulary, etc.

Τί τοῦτο, etc. *What is this that you now weep? Why do you weep now? Have you not long known that from my birth death was pronounced against me by nature?*

Επιῤῥεοντων, the genitive absolute; *if I perished prematurely, while good was flowing in; χαλεπῶν, but while hardships are before me*; ευθυμεω (ευ and θυμος), *I am glad, rejoice*; ὡς ευπραγοῦντος ἐμοῦ, the genitive absolute, *on the ground that I am a happy man.*

Καταψαω, I stroke.
Ακουομενος, scil ὁ Σωκρατης.
Τουτου, genitive of the object, *for this.*
Πανσαμενον, *when you have left off.*
Διαγω I live.
Θερμῳ λουεσθαι, *to take a warm bath.*
Ασκληπιος, οῦ, ὁ, *in the temple* (νεῳ) *of Esculapius.*
Δυσαρεστος, *difficult to be pleased,*
Ἀῤῥωστος, ον, *weak.* (ῥωννυμι, *I am strong*).
Αῦ, *on another occasion.*

LESSONS IN SPANISH.—No. VI.

RELATIVE PRONOUNS.

The relative pronouns are *quien*, who; *el cual*, who, which, that; *que*, who, which, that; *cuyo*, whose, or, of which. They are thus declined:—

Singular.		*Plural.*	
Masc.	Fem.	Masc.	Fem.
Quien.		*Quienes.*	
Que.		*Que.*	
*El cual**	*la cual.*	*Los cuales*	*las cuales.*
Cuyo	*cuya.*	*Cuyos*	*cuyas.*

Quien always relates to persons, and agrees with its antecedent in gender and number; as,

El general es quien los vió, the general is (he) who saw them.
Las reinas son quienes le maldijeron, the queens are (they) who reviled him.

When *quien* (or *quienes*) is governed by a verb, it is always preceded by the preposition *á*; as,

La dama á quien vmd. teme, the lady whom you fear.

El cual and *que*, like the relative pronoun *that* in English, relate both to persons and things, agreeing with their antecedent in gender and number. *El cual* is generally to be used to prevent the repetition of *quien* or *que*; as,

La vaca que vió, y de la cual habla, es tímida, the cow which he saw, and of which he speaks, is timid.

Cuyo is the possessive relative pronoun, answering to Whose, which, or of which, in English, and agrees with the noun which comes after it; as,

El hombre cuya madre es buena, the man whose mother is good.
La casa cuyos cuartos son espaciosos, the house of which the rooms are spacious.
El centurion los envió á Joppa, en cuya ciudad moraba Simon, the centurion sent them to Joppa, in which city was dwelling Simon.

When the relative pronoun refers to persons, *que* is generally used for *quien*, in the nominative case; but in the objective case *á quien* or *que* is used (generally the former); as,

El hombre que habla, the man who speaks.
Yo que hablo, I who speak.
La muger á quien Juan vió, or *la muger que Juan vió*, the woman whom John saw.

If a preposition come before Whom, *quien* is always used in Spanish; as,

El muchacho para quien él lo hizo, the boy for whom he did it.
Un hombre en quien el rey tiene mucha confianza, a man in whom the king has much confidence.

What, when it means *that which*, is, in Spanish, *lo que*; when it means *what thing*, it is *que*; and when used before a noun, What or Which is *que* or *cual*; as,

Lo que á algunos gusta á otros disgusta, what to some is pleasant, to others is disgusting.
El dijo, yo no sé que, he said I know not what.
Yo no sé que libros leer, or *yo no sé cuales libros leer*, I know not what (or which) books to read.

He who, or he that, is in Spanish *el que*; she who, *la que*; they or those who, *los que* (masc.), *las que* (fem.). There is also the neuter form, *lo que*.

In Spanish a preposition is always placed before the relative pronoun which it governs; as,

La ciudad en que yo moro, the city in which I dwell.

We cannot say, "the city which I dwell in," in Spanish.

The relative pronoun can never be suppressed in Spanish as in English; thus, "the man I saw," must be expressed in full, "the man whom I saw."

Vocabulary.

Cuidado, care, anxiety.	*Dios*, God.
Juan, John.	*María*, Mary.
Cuarto, room.	*Nombre*, name.
Ciudad, city.	*Sabiduría*, wisdom.
Agradable, agreeable, pleasant.	*Desgraciado*, unfortunate, unhappy.
Posible, possible.	*Imposible*, impossible.
Sabe, (he) knows.	*Saben*, (they) know.
Hacer, to make, to do.	*Decir*, to say.
Leer, to read.	*Tomar*, to take.

Model Sentences.

Mis hermanos son quienes los vió, my brothers are (they) who saw them.
Los pintores á quienes vmd. vió, y de los cuales Juan habló, son muy ricos, the painters whom you saw, and of whom John spoke, are very rich.
El hombre cuyo hermano es general del ejército, halló un tesoro en la ciudad, the man whose brother is general of the army, found a treasure in the city.
Ella sabe lo que es bueno, she knows what is good.
La que tiene dinero, tiene cuidado, she who has money, has care.

Spanish-English.

El juez es quien vió las cartas que vmd. escribió. Las Francesas son quienes dieron los libros á Pedro. El hombre á quien el Aleman dió los sombreros, es muy rico é ignorante. Las mugeres á quienes el médico escribió las cartas, son muy pobres é ignorantes. El juez dió los libros á un pintor[s] ingles[1], en quien el médico tiene mucha confianza. Las mugeres para quienes Pedro escribió las cartas, son muy hermosas y ricas. La Española á quien Pedro ama, es muy hermosa. Las Fran-

* *Lo cual* is sometimes used instead of *el cual*.

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cesas á quienes vmd. vió, me escribieron muchas cartas. Las cuebaras que María tiene, y las cuales el Frances halló, son mias. El caballo que Juan vió, y del cual Pedro habló, es robusto y fuerte. Las calles cuyas casas son hermosas, son agradables.

El criado cuyo nombre es Pedro, vino á mi casa. Las casas cuyos cuartos son espaciosos, son muy agradables. Juan dió el libro á una muger cuyo nombre es María. El pintor y el impresor vinieron á Madrid, en cuya ciudad el pintor halló un tesoro. El hombre que tiene prudéncia, es muy sábio. El hombre que tiene dinero, tiene cuidado. La muger que es sobérbia é ignorante, es desgraciada. Los hombres que tienen dinero, tienen cuidados. Lo que es imposible para los hombres, es posible para Dios. Lo que es nuevo, no es viejo. El pintor tiene el tesoro que el médico halló en la calle. Pedro ama lo que es bueno. Ella sabe que hacer. El hombre no sabe que hacer. Pedro sabe lo que es bueno. La Francesa no sabe que decir. Las hijas del juez no saben que comprar. El pintor no sabe que libro leer. Los Alemanes no saben cual sombrero tomar. Mi hermana no sabe cuales libros leer.

La que es sobérbia, no es amabla. Los que aman la verdad, son sabios. El que tiene sabiduría, tiene prudéncia. Mi hermano tiene un tesoro, que su criado halló en la ciudad. El que tiene prudéncia, es sábio. Los que nos dieron los libros, son amigos nuestros. La que no es agradable, es desgraciada. La ciudad en que Juan halló el tesoro, es grande y hermosa. La muger á quien María habló, es muy amable. El que tiene oro, tiene mucho cuidado. El Aleman dió dos libros al hombre á quien Juan vió. El médico dió tres libros á la Francesa en quien mi madre tiene mucha confianza. El pintor fué á Madrid, en cuya ciudad las calles son agradables y las casas hermosas. Las criadas no saben que hacer.

English-Spanish.

The physician is (he) who wrote the letter which you (*vmd.*) saw. The judge is (he) who saw the letters which you (*vmd.*) wrote. The Spanish-women are (they) who gave the books to Peter. The man to whom John gave the hats is very rich and ignorant. The women to whom the judge wrote the letters are very poor and ignorant. The women for whom Mary wrote the letters are very amiable and beautiful. The physician gave the spoons to an English[2] painter[1], in whom the judge has much confidence. The French-woman whom Peter loves is very beautiful. The German-woman whom you (*vmd.*) saw wrote me many letters. The spoons which Mary has, and which the French-woman found, are mine. The male-servant who came with me is strong and robust. The horse which John saw, and of which (*del cual*) Peter spoke, is strong. The streets whose houses are beautiful are agreeable.

The man whose name is John came to my house. The woman whose name is Mary gave me three books. The houses whose rooms are spacious are very pleasant. John gave three silver spoons to a woman whose name is Mary. The painter and the printer came to Madrid, in which city the painter found a treasure. The man who is prudent is wise. The woman who is proud and ignorant is unhappy. The men who have money have cares. That which is possible for Peter is possible for John. What is possible for the painter is not possible for the carpenter. The Frenchman has the treasure that the physician found in the street of the city. Peter loves what is good. Mary knows what is good. The German knows what to-do. The painter knows not what to-do. The French-woman knows not what to-say. The physician's sister knows not what to-buy. The male-servants know not what to-say. My father knows not what book to-read. My brothers know not which books to-buy. The Germans know not which hat to-take. She knows not what spoon to-take.

He that has much gold has much care. She that is proud is not amiable. They who love the truth are wise. He who has wisdom has prudence. He who has prudence is wise. My father has a treasure which his male-servant found in the city. They who gave us the books are friends (of) ours. She who is not agreeable is unfortunate. Those who are ignorant and impious are unhappy. The city in which Peter found the books is large and beautiful. The woman to whom Mary spoke is very agreeable. The painter went to Madrid, in which city the streets are pleasant and the houses handsome.

INTERROGATIVE PRONOUNS.

The interrogative pronouns are the same as the relative, except that *cual* is used without being preceded by the article. They are not used in precisely the same manner; for in interrogations, *quién* always means, who; *cual*, which; *qué*, what; *cuyo*, whose; as,

¿ Quién tiene hambre?* † who is hungry?
¿ Quiénes tienen sed? who are thirsty?
¿ Cual de los hijos está allí? which of the sons is there?
¿ Qué dijo el médico? what said the doctor?
¿ Qué sombrero tiene vmd.? what hat have you?
¿ Cuyos libros son estos? whose books are these?
¿ De quién son estos libros? whose (or of whom) are these books?

When the interrogative pronoun is governed by a preposition, the answer to the question must always be preceded by the same preposition; as,

¿ De quién son aquellos niños? De Juan. Whose are those children? John's.
¿ Para quién lo hizo? Para la muger. For whom did-he-do it? For the woman.

When What is used in ejaculatory interrogations, as, What a fine day! what a man! the indefinite article is omitted in Spanish; as,

¿ Qué hermosa mañana! What a fine morning!
¿ Qué desgrácia! What a disgrace!
¿ Qué modrego! What a blockhead!

In Spanish, all that is necessary to form an interrogative sentence, is to place the interrogation mark before (inverted) and after the sentence. Thus, *Juan tiene dinero*, means, John has money; and *¿ Juan tiene dinero?* means, Has John money? It is, however, common (though not necessary) in Spanish, to place the nominative after the verb in interrogations; as, *¿ Tiene Pedro dinero? ¿ tienen los pintores libros?* Has Peter money? have the painters books?

The auxiliary verb Do is unknown in Spanish (as also in all the languages of Europe except the English), and all such expressions as—Does John speak?—do they love?—how much do you ask a week?—did it not snow during my absence?—did they see her?—Peter did speak,—must be rendered in Spanish by the simple form of the verb; as, *¿ Habla Juan?—¿ aman ellos?—¿ cuánto pide vd. por semana?—¿ no nevó durante mi ausénsia?—¿ la vieron ellos?—Pedro habló;* that is,—speaks John?—love they?—how much ask you per week?—snowed it not during my absence?—her saw they? (or, saw they her?)—Peter spoke.

Vocabulary.

Azúcar, sugar.	*Pan*, bread.
Manteca, butter.	*Agua*, water.
Especie (fem.), species, sort.	*Boton*, button.
Señor, sir.	*Señora*, madam, lady.
Si, yes.	*No*, no.
Toma, (he) takes.	*Dicen*, (they) say.
Dice, (he) says.	*Dijo*, (he) said.
Habla, (he) speaks.	*Entiende*, (he) understands.
Quiere, (he) wishes, (he) wants.	*Quieren*, (they) wish, (they) want.

Model Sentences.

¿ Quién tiene azúcar? who has sugar.	*¿ Qué libro tiene vm.?* what book have you?
¿ Quién habla Ingles? who speaks English.	*¿ De quién es el tesoro?* whose is the treasure?
¿ Cual de los dos pintores tiene dinero? which of the two painters has money?	*¿ Quiere su hijo pan señor?* does your son want bread, sir?
¿ Qué dijo la hija del juez? what said the judge's daughter.	*No, señor, mi hijo tiene pan,* no, sir, my son has bread.

* *Quién* and *qué*, when interrogative, generally have the accent marked.
† Literally this is "Who has hunger?" In Spanish, in interrogations and exclamations, the interrogation and exclamation marks are placed at the beginning (inverted) as well as at the end of the phrase or sentence.

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Spanish-English.

¿Quién es bueno? ¿Quiénes son ricos? ¿De quién son las casas? ¿Cuyos libros tiene vmd.? ¿Cual de los dos hijos del juez halló un tesoro? ¿Qué dijo vmd.? ¿Qué sombrero tiene vmd.? ¿Qué tesoros halló Pedro? ¿Qué quiere vm.? ¿Qué lengua habia el general? ¿Para quién escribió María las cartas? Para la muger. ¿A quiénes dió Juan los libros* españoles? A los Alemanes. ¡Qué hombre es vm.! ¡Qué hermosa muger! ¿Quién quiere pan? ¿Quién quiere azúcar? ¿Quién habla Español? ¿Quién entiende el Ingles? ¿Quién ama la verdad? ¿Quién habla el Frances? ¿Quién entiende lo que Juan dice? ¿Qué espécie de botones quiere vm.? ¿Qué espécie de azúcar tiene Pedro? ¿Qué quieren vms.? ¿Qué libros quieren los pintores? ¿Qué dicen los jueces?

¿Tome vmd. água? ¿Qué dijo el hermano del médico? Señora, ¿quiere vmd. manteca? ¿Habla su hijo Español, señor? Si, señor, mi hijo habla Español. ¿Entiende su hija de vmd. el Ingles, señora? No, señor, ella no entiende el Ingles. ¿Cuyas cucharas tiene la Francesa? ¿Cuyos botones tienen los criados? ¿Cuyo sombrero tiene Juan? ¿Qué libros tiene Pedro? ¿Quién tiene hambre? ¿Quiénes tienen sed? ¿Qué espécie de cucharas tienen las hermanas del Americano? ¿Qué dicen los Españoles? ¿Qué quieren Pedro y Juan? ¿Toma el pintor água? ¿Quién entiende lo que vms. dicen? ¿Qué dijo el padre del médico? ¿Quién tiene pan? ¿De quién son los libros? ¿Cual de los Franceses habla Español? ¿A quién habla vm.?

¿Tiene vm. dinero? ¿Tienen los carpinteros muchos amigos? ¿Tiene V. muchos libros? ¿Tiene el libro hojas de oro? ¿Tienen los jueces hambre? ¿Es V. Español? ¿Son las casas nuevas? ¿No son sus amigos ricos? ¿Sus hermanas no son tan ricas como él? ¿Mis hermanos no son mas ricos que los carpinteros de nuelo? ¿Escribió el criado de juez cartas á las criadas de la Francesa? ¿Es la muger amable? ¿Son los Ingleses mas sobérbios que los Alemanes? ¿Halló el pintor dos libros en la callo de la ciudad? ¿Tienen los criados hambre? Si, señor, los criados tienen hambre. ¿Tienen las Españolas sed? No, señor, las Españoles no tienen sed.

English-Spanish.

Who is wise? Who is rich? Who are good? Who are culpable? Who is strong? Who are robust? Of whom does John speak? Of the physician. Whose (of whom) are the houses? Peter's. Whose hooks has Mary? Whose buttons have the male-servants? Whose spoons have my sisters? Which of the two sons of the physician found a treasure in the road? Which of the two men is culpable? What say you? * (what says your-worship?) What did you say? What does John wish? (what wishes John?) What does Peter say? What do the judges say? What hat have you? What treasures did Peter find? (what treasures found Peter?) What do you wish? What language does the general speak? For whom did John write the letters? For the French-woman. To whom (plur.) did John give the French books? To the daughters of the judge. What a woman! What a beautiful city! Who wishes bread? Who wishes sugar? Who speaks English? Who understands Spanish? Who speaks French? Who understands what Mary says? Who understand what the Americans say? What sort of spoons do my friends want? What do the women say?

Do you take water? Do you take auger? What did John's sister say? What did the physician's brother say? Do you want butter, sir? (sir, wishes your-worship butter?) Does your son speak Spanish, sir? (speaks his son Spanish, sir?) Yes, madam, my son speaks Spanish. Does your daughter understand English, madam? No, sir, my daughter does not understand English. Whose spoons has the female-servant? Whose hat has Peter? Whose buttons have the painters? What books has Mary? What bread have you? Who is thirsty? (whe has thirst?) Who are hungry? What do the Spaniards say? What do Peter and John wish? What sort of spoons has the carpenter's daughter? Does the German take water? Who understands what you (plur.) say? What does the painter's father say? Who has butter? Whose (of whom) are the books? Which of the two Spaniards speaks English? To whom do you speak?

Have you money? Have the Frenchmen many friends? Have you many books? Has the book leaves of gold? Are the women hungry? Are you (a) Spaniard? (is your-worship Spanish?) Are you (a) Frenchman? Are you (a) German? Are the houses new? Are not his friends rich? Are not his brothers as rich as he? Are (*son*) not my brothers richer than the judge's sons? Did the painter's son write letters to the French-woman? Is the woman amiable? Are the Spaniards prouder than the English? Did the painter find (found the painter) two books in the road? Are the Germans hungry? Yes, sir, the Germans are hungry? Are the Spanish-women thirsty? No, madam, the Spanish-women are not thirsty. Is John (a) carpenter? Yes, sir, John is (a) carpenter.

* The learner can use *vm.*, *vmd.*, *V.*, *Vm.*, *Vd.*, or *Vmd*, in the singular for You.

FRENCH READINGS.—No. XXIX.

L'ENFANCE DU POETE.

POURQUOI devant mes yeux revenez-vous sans cesse,
O jours de mon enfance et de mon allégresse?[1]
Qui donc toujours vous rouvre[a] en nos cœurs presque éteints,
O lumineuse fleur des souvenirs lointains?[2]

Oh! que j'étais heureux! oh! que j'étais candide![3]
En classe,[b] un banc de chêne, usé,[c] lustré, splendide,
Une table, un pupitre, un lourd encrier noir,[4]
Une lampe, humble sœur de l'étoile du soir,[5]
M'accueillaient[d] gravement et doucement; mon maître,
Comme je vous l'ai dit souvent, était un prêtre[6]
A l'accent calme et bon, au regard réchauffant,[e]
Naïf comme un savant, malin[f] comme un enfant,
Qui m'embrassait, disant, car un éloge excite:
—Quoiqu'il n'ait que neuf ans, il explique Tacite.[7]
Puis, près d'Engène, esprit qu'hélas Dieu submergea,
Je travaillais dans l'ombre,—et je songeais déjà[8]
Tandis que j'écrivais;—sans peur, mais sans système,[g]
Versant le barbarisme à grands flots sur le thème,
Inventant aux auteurs des sens[g] inattendus.[10]
Le dos courbé, le front touchant presque au Gradus,[h]
Je croyais, car toujours l'esprit de l'enfant veille,
Ouïr confusément, tout près de mon oreille,
Les mots grecs et latins, bavards et familiers,[11]
Barbouillés d'encre, et gais comme des écoliers,
Chuchoter, comme font les oiseaux dans une aire,
Entre les noirs feuillets du lourd dictionnaire;[12]
Bruits plus doux que le bruit d'un essaim qui s'enfuit,
Souffles plus étouffés[i] qu'un soupir de la nuit,
Qui faisaient par instants, sous les fermoirs de cuivre,
Frissonner vaguement les pages du vieux livre![13]
Le devoir fait, légers comme de jeunes daims,
Nous fuyions, à travers les immenses jardins,[14]
Eclatant, à la fois en cent propos contraires.
Moi, d'un pas inégal,[15] je suivais mes grands frères;
Et les astres sereins s'allumaient dans les cieux,[16]
Et les mouches volaient dans l'air silencieux,[17]
Et le doux rossignol, chantant dans l'ombre obscure,
Enseignait la musique à toute la nature;[18]
Tandis, qu'enfant jaseur, aux gestes étourdis,
Jetant partout mes yeux ingénus et hardis,[19]
D'où jaillissait la joie en vives étincelles,[20]
Je portais sous mon bras, noués par trois ficelles,
Horace et les festins, Virgile et les forêts,
Tout l'Olympe, Thésée, Hercule, et toi, Cérès,[21]
La cruelle Junon, Lerne et l'hydre enflammée,
Et le vaste lion de la roche Némée.[22]

VICTOR HUGO.

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COLLOQUIAL EXERCISE.

1. Quelle question fait d'abord le poète?
2. Quelle autre question fait-il?
3. Que dit-il de son enfance?
4. Que trouvait-il en classe?
5. Comment appelle-t-il sa lampe?
6. Quel était son maître?
7. Que disait le maître en embrassant l'enfant?
8. Que dit le poète de son travail près d'Eugène?
9. Comment écrivait-il?
10. Comment expliquait-il les auteurs?
11. Que croyait-il entendre confusément?
12. Où croyait-il entendre ces bruits?
13. Que faisaient ces bruits?
14. Que faisaient les écoliers lorsque le devoir était terminé?
15. Comment l'enfant suivait-il ses grands frères?
16. Que voyait-on dans les cieux?
17. Que faisaient les mouches?
18. Que faisait le doux rossignol?
19. Que faisait alors l'enfant jaseur?
20. Qu'est-ce qui jaillissait des yeux de l'enfant?
21. Que portait-il sous son bras?
22. Que portait-il encore?

NOTES AND REFERENCES.—*a.* rouvre, *readmits.*—*b.* en classe, *in the class-room.*—*c.* usé, *worn.*—*d.* m'accueillaient, *welcome me*; from *accueillir*; L. part ii., p. 76.—*e.* réchauffeot, *encouraging*; literally, *warming.*—*f.* malin, *playful.*—*g.* sens, *meanings.*—*h.* Gradus, *gradus, poetical lexicon.*—*i.* étouffés, *subdued.*

L'EMPLOI DU TEMPS.

AU point de vue chrétien, le temps, ce domaine de Dieu, nous a été prêté par lui, pour gagner le royaume du ciel.[1] Aussi dès le commencement du christianisme, l'emploi du temps a-t-il été strictement réglé par tous ceux qui voulaient vivre selon Dieu;[2] et jamais l'oisiveté n'a été la compagne de la sainteté.[3]

Au point de vue proprement[a] humain,[4] le temps est tout aussi précieux; il sert[b] à gagner la fortune,[5] à acquérir les talents et les connaissances dont on a besoin, à remplir dans toute leur étendue les devoirs de l'état où l'on se trouve engagé; et jamais, nous osons le dire, ces devoirs ne seront accomplis[c] par une personne qui ne connaît pas le prix du temps.[6] Filles, épouses, mères, quel[d] que soit le bon désir qui vous anime,[7] si[e] vous n'êtes avares du temps, jamais vous ne serez à la hauteur de vos obligations. Les jours, les semaines, les mois, les années s'écouleront,[8] et vous n'aurez rempli[f] que la moindre partie de votre tâche, et vous n'emporterez que de tardifs[g] regrets.

Sans vouloir astreindre servilement nos jeunes lectrices à un plan de vie, nous leur conseillerons cependant de se faire à elles-mêmes une règle qui les guide,[9] et de diviser les heures de leur journée de façon que chacune d'elles ait son occupation ou son délassement.[10] Que la prière, l'étude, la lecture, les arts d'agrément, les travaux d'aiguille,[11] aient des heures fixes; que les promenades, que les visites aient également des moments réglés;[12] que l'heure du lever soit invariable et aussi matinale que possible,[13] et la journée sera remplie. Et le soir en jetant un coup d'œil sur le tableau des heures écoulées, l'on ne sentira pas le regret insupportable, le malaise cruel que fait naître l'oisiveté,[14] ce triste fléau que suivent l'ennui et le dégoût de soi-même.

Aimons l'ordre, pour Dieu, puisqu'il a mis tant d'ordre en ses œuvres;[15] pour nous-mêmes, puisque c'est le moyen d'employer la vie,[16] ce don d'en haut;[h] et pour les autres, puisque c'est le moyen de leur être utiles[17] et de ne pas séjourner ici bas sans laisser une trace de son passage et un doux souvenir après soi.

EVELINE RIBBECOURT.

COLLOQUIAL EXERCISE.

1. Pourquoi Dieu nous a-t-il prêté le temps?
2. Qu'a-t-on fait dès le commencement du christianisme?
3. Qu'est-ce que l'oisiveté n'a jamais été?
4. Sous quel point de vue le temps est-il tout aussi précieux?
5. A quoi sert-il aussi?
6. Quelle personne ne remplira jamais ces devoirs?
7. Comment l'auteur s'adresse-t-elle aux filles, aux épouses, aux mères?
8. Que dit-elle à des jours, des semaines, des mois, des années?
9. Que conseille-t-elle à ses jeunes lectrices?
10. Comment devront-elles diviser leur journée?
11. A quoi devront-elles donner des heures fixes?
12. Que dit-elle à l'égard des visites?
13. Que recommande-t-elle à l'égard de l'heure du lever?
14. Que ne sentira-t-on pas le soir?
15. Pourquoi devons-nous aimer l'ordre pour Dieu?
16. Pourquoi devons nous l'aimer pour nous-mêmes?
17. Pourquoi devons-nous aussi l'aimer pour les autres?

NOTES AND REFERENCES.—*a.* proprement, *merely*—*b.* from *servir*; L. part ii., p. 106.—*c.* L. S. 45, R. 2.—*d.* L. S. 87, R. 2, 3.—*e.* si, *unless.*—*f.* L. S. 41, R. 5, 8.—*g.* L. part ii. § 85, R. (10).—*h.* d'en haut, *from above.*

CHRONOLOGY.—No. V.

A.D.
306.—Constantius dies at York; Constantine proclaimed Emperor.
307.—Constantine busies himself with the Frank and German wars.
308.—Cardinals first appointed.
313.—The persecution of the Christians ends by an edict of Constantine which allows them freedom to worship in their own way.
314.—Lactantius and Eusebius, Christian writers, flourished.
323.—The Goths invade the Roman Empire, but are repulsed.
324.—Helena, the mother of Constantine, makes a journey to the Holy Land (Palestine).
325.—The first General Council at Nice held, where was composed the famous Nicene Creed.
330.—Constantine removes the seat of empire from Rome to Byzantium, which is thenceforth called Constantinople.
331.—Constantine orders all the heathen temples to be destroyed.
332.—Great defeat of the Goths.
337.—Death of Constantine.
338.—Commencement of the war between the Romans and Persians.
343.—Dreadful persecution of the Christians throughout the Persian Empire.
362.—Julian, surnamed the Apostate, returns to paganism, and exerts himself to restore it throughout the empire.
364.—Valentinian defends the frontiers of Gaul and Britain against the inroads of the barbarians.
370.—Public schools established throughout the whole extent of the Roman Empire. The Christian fathers, Jerome and Ambrose, flourished.
373.—Death of Athanasius, Bishop of Alexandria.
375.—The Huns, pushed forward from Tartary by the Chinese, swell the tide of barbarian immigration in Europe.
376.—The Visigoths, or Western Goths, permitted to settle within the Roman dominions; similar privileges granted to the Eastern Goths. The Goths begin to ravage the provinces.
377.—War with the Goths.
379.—Theodosius, surnamed the Great, carries on the war against the Goths with vigour and success.
382.—Submission of the Western Goths; 40,000 drafted into the army of Theodosius.
395.—The Christian fathers, Augustin and Chrysostom, flourished.
396.—Greece ravaged by Alaric, king of the Western Goths.
403.—Alaric invades Italy, but is forced to retreat into Illyricum.
405.—A horde of Germans, under Radagaisus, invades Italy, but is defeated.
407.—The Vandals inundate Gaul.
409.—Alaric a second time advances upon Rome. The Vandals burst into Spain.

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ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LXII.

(*Continued from page* 132.)

CONSTANT-CURRENT PILES.

Principle of the Construction of Constant-Current Piles.—Piles with a single liquid are now generally out of use, owing to the rapid enfeeblement of the current. Use is made of piles with two liquids and partitions, because their action preserves a pretty constant intensity for a long time. The piles of this kind which are most frequently employed are Daniell's, Grove's and Bunsen's.

In these piles the inconveniences of piles with a single liquid are corrected by means of two liquids capable of reacting upon each other, and separated by a partition, which allows the current to pass easily, but does not permit the two liquids to be mixed together—at least not readily. The two elements of the same couple are dipped into the liquids, one into one of them, and the other into the other. The conditions necessary to the success of these piles are—1. That only one of the elements of the piles being active, the other should be subject to no chemical action, but act merely as a conductor. 2. That the two liquids should be chosen in such a way that the current resulting from their mutual action through the partition, may be in the same direction as that to which the action of the acid upon the metals gives rise.

Daniell's Pile.—One of the first constant-current piles ever constructed was that of Daniell, the eminent professor of chemistry at King's College, London, whose sudden death in the lecture room, a few years ago, shed a gloom over all scientific circles, and left a gap which cannot be easily filled up, as men of his superior endowments are not to be met with every day. Fig. 424 represents a couple of this pile, the form of

Fig. 424.



which has been subject to great changes. A glass vessel V, is filled with an acid solution of sulphate of copper, into which is plunged a red copper cylinder C, having several holes at the side and open at the two ends. At the upper part of this cylinder is a circular rim or cell C, with small holes below, which are dipped into the solution. This cell is intended to contain the crystals of sulphate of copper, which melt as the apparatus comes into play. Lastly, inside the cylinder C, is a porous earthenware vessel or partition P, filled with a solution of sea-salt, into which is plunged a cylinder Z, open at both ends, and made of zinc amalgamated with mercury. To the zinc and copper cylinders are fixed (by means of thumb-screws) two thin plates of copper, which form the electrodes of the pile.

As long as the two electrodes do not communicate together, the pile is inactive, but directly the communication is established, chemical action begins; the water is decomposed, its oxygen combines with the zinc, and its hydrogen, reacting upon the sulphate of copper, combines with the oxygen in the oxide of the salt, so as to form water, while the copper forms a non-adherent, dusty deposit on the sides of the cylinder C. The solution of the sulphate of copper tends rapidly to get weaker, but as the crystals placed in the cell C, dissolve at a regular rate, the degree of concentration of the solution remains constant. As for the sulphuric acid which is set free by the decomposition of the sulphate of copper, it combines (at the same time as the oxygen of the water) with the zinc, so as to transform it into a sulphate; and as the quantity of sulphuric acid set at liberty in the solution of the copper is pretty uniform, the action of this acid on the zinc is so also.

With this pile effects may be obtained which last for several hours, and even days, if care is taken to keep the solution in a state of saturation, by adding crystals of sulphate of copper from time to time. To combine several couples, join the zinc pole of one couple with the copper pole of the next couple by means of thumb-screws, and so on from one couple to another, as seen in fig. 423, which represents another kind of pile. With regard to the nature of the poles, it is the electrode fixed to the zinc which is negative, and that fixed to the copper which is positive, as in piles which we have already described.

Instead of an earthenware porous vessel, some employ gold-beater's skin, animal membrane, paper, plaster of Paris, canvas, or any like substance, to separate the two solutions. The effect is at first more powerful than with a porous vessel, but the two solutions mix together more rapidly, and thus weaken the effect. In general the partitions ought to be permeable to the electrical current, but prevent as much as possible the mixture of the two liquids.

Daniell's pile is designed to remedy the defects of an ordinary one. These defects, which cause the electromotive action to subside rapidly, and soon cease, are the following:—1. The sulphuric acid becomes saturated with the oxide of zinc. 2. The hydrogen adheres to the surfaces of the metals, and thus prevents their perfect contact with the water. 3. By the chemical action of the pile, the zinc contained in the sulphate of zinc which is formed, is reduced to the metallic state at the surface of the copper, and deposited upon it in the form of a crust, where it acts locally and impairs the conducting power. 4. Electricity is carried off and dissipated by the escaping hydrogen. The adhesion of hydrogen to the zinc plate does not take place when that metal is pure or amalgamated with mercury; which is the reason why Daniell employs a cylinder of amalgamated zinc, instead of a plate of the common and impure metal. But the peculiar and most valuable feature of his battery is the use of the porous partition, which, as we have seen, may be made of various substances, and which divides the vessel containing the metals into two cells. The partition freely transmits the electrical current, but prevents the passage of the sulphate of zinc to the copper plate, and thus remedies the third of the above-mentioned defects. The sulphate of copper being decomposed must be continually renewed by placing crystals of it in the circular cell; while the nascent hydrogen unites with the oxygen of the oxide of copper, so as to form water, and therefore does not interfere with the action of the conducting plate, nor carry off electricity.

Fig. 425.

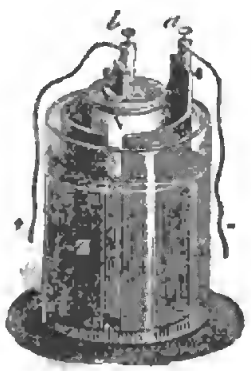


Fig. 426.



Grove's Pile.—Fig. 425 represents a couple of Grove's pile. This couple consists of the following parts:—1. A glass vessel

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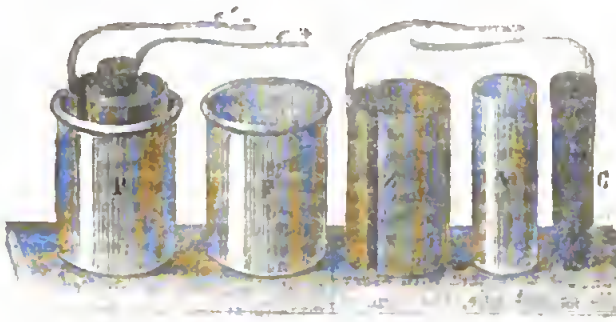
A, partly filled with sulphuric acid and water. 2. A zinc cylinder open at both ends and divided along its whole length. 3. A porous vessel V, made of earthenware not much hardened by fire, and filled with common nitric acid. 4. A plate of platinum bent like the letter S, as in fig. 426, and fastened to a lid *c*, which is placed upon the porous vessel. A metallic rod *b*, communicating with the platinum plate, has a copper wire which serves as the positive electrode, while a second wire, fastened to the zinc, serves as the negative electrode. The zinc of which the plate is made is amalgamated with mercury.

This pile acts very energetically in consequence of a chemical action between the two acids through the partition, which develops a supplementary or secondary current in the same direction as that produced by the zinc plate. Yet it is not often used, owing to the expensiveness of the platinum. This metal is also attended with another inconvenience, which is, that when the pile has been in operation for some time, it becomes brittle and breaks very easily.

shaped pieces, capable of being put within one another. These pieces are—1. An earthenware or glass jar X, fig. 427, filled with a solution of ten or twelve parts of water to one of sulphuric acid. 2. A hollow cylinder Z, made of amalgamated zinc, to which is fastened a thin, narrow strip of copper, intended to serve as the negative electrode. 3. A porous vessel V, made of slightly burnt earthenware, into which common nitric acid is poured. 4. A coal cylinder C, prepared as described above, and a good conductor. At the top of the cylinder a copper ring is fastened on, to which a strip of the same metal is soldered, serving as the positive electrode. When you wish to work the apparatus, arrange it as at P in the figure, by placing the zinc cylinder in the earthenware vessel, then the porous earthen vessel, and lastly the coal cylinder.

As long as the zinc and the coal do not communicate together, the pile is inactive, but directly a communication is established by means of a conducting circuit, chemical action begins. The water into which the zinc is plunged, is decom-

Fig. 427.



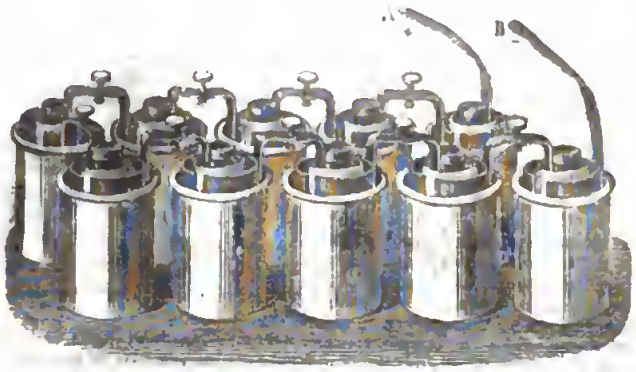
Bunsen's Pile.—This pile, which is also known under the name of the *coal* pile, is the same as Grove's, with the exception that the plate of platinum is replaced by a cylinder made of an artificial preparation of coal. This cylinder is made by intimately mingling one part of caking coal and two parts of coke, the proportions varying according to the caking property. Some add to the mixture two parts of rye flour. The mixture is introduced into a cylindrical mould of sheet iron, in the centre of which is placed a case of wood or pasteboard, to facilitate the escape of gas during calcination. The mould is closed by a moveable cover well fitted on and luted; the whole heated gradually to redness, and the calcination continued until the disengagement of gas ceases. The cylinder may be finished with a file or saw, or on a lathe. Before proceeding to this last operation, in order to increase the cohesiveness of the cylinders, it is necessary to soak them in a strong solution of molasses, dry them, and subject them to a very intense calcination.

Each couple of the coal pile consists of four cylindrically-

posed by that metal and by the sulphuric acid, thus forming sulphate of zinc. As for the hydrogen which is set at liberty, it passes over to the nitric acid in the porous vessel and decomposes it, transforming it into hypo-nitric acid, one part of which is dissolved and the other disengaged. During these various reactions two currents are produced, the one arising from the decomposition of the water, and the other from the decomposition of the nitric acid. These two currents, which are in the same direction, go along the conductor from the coal to the zinc; that is to say, the positive pole corresponds to the coal, and the negative to the zinc.

To form a regularly constituted apparatus or pile, the couples must be arranged as shown in fig. 428. To the zinc and coal cylinders are attached strips of copper, bent over and joined by means of thumb-screws, care being taken to make the coal of each couple communicate with the zinc of the next one, and to end the first and last couple with two electrodes, A and B. In recent investigations M. Despretz has employed as many as 800 couples.

Fig. 428.



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Bunsen's pile is the most powerful of all the constant-current piles, and most frequently used. However, the current grows weaker rather rapidly, as the sulphuric acid combines with the zinc. This pile has also the disadvantage of giving out vapours of hypo-nitric acid, which are a serious inconvenience when the couples are at all numerous.

To vary the surface according to the effects to be produced, M. Deleuil constructed Bunsen couples of two sizes, which we shall denote by *large* and *small models*. In the former the zinc cylinder is about eight inches and a half high, in the latter about five and a half. M. Deleuil considers that, as far as the effects dependent upon surfaces are concerned, a large model couple is equivalent to about two couples of the small model. In future, when we speak of a number of couples, without mentioning the model, the small model is to be understood.

In the coal pile, the zinc and sulphuric acid were at first put in the porous vessel, and the coal occupied the present place of the zinc. In this arrangement the surface of the zinc being less than the present, the chemical action was also less, and consequently the development of electricity was less too.

Property of Amalgamated Zinc.—M. de la Rive has observed that zinc when perfectly pure is not liable to be acted upon by sulphuric acid diluted with water, but becomes so if it is put in contact with a plate of platinum or copper, which is plunged in the solution. Common zinc, on the contrary, which is not pure, is liable to intense action from the diluted acid. However, if it is amalgamated with mercury, it acquires the property of pure zinc, and is only acted upon when it is in contact with a copper or platinum wire, which is also plunged in the solution; that is to say, when it forms part of a couple in a state of active operation.

This property seems to be owing to the electrical condition assumed by the zinc through its contact with the mercury. It has this advantage for use in piles, that as long as the current is not closed, that is to say, so long as there is no current, the zinc is not acted upon. It is observable also, that with amalgamated zinc the current is more regular, and at the same time more intense for the same quantity of dissolved metal.

To amalgamate the zinc, first plunge it in water acidulated with sulphuric acid, in order to clean it, and then soak it in mercury for about a minute. Then take it out, and let the excess of mercury drop off.

LESSONS IN GEOLOGY.—No. LVII.

By Thos. W. Jenkyn, D.D., F.R.G.S., F.G.S., etc.

CHAPTER V.

ON THE CLASSIFICATION OF ROCKS

SECTION X.

ON THE PERMIAN FORMATION.

In our last "Lesson" you were told that the system of rocks which was formerly called the New Red Sandstone, is now divided into two separate groups, of which the upper group is called the Trias, and the lower group the Permian.

Perm was an ancient kingdom, but now forms a large province of Russia, and occupies an area of about three times the size of England. In Perm, the New Red Sandstone covers a space of 4,000 miles in circumference. In this region, as well as in Saxony and other parts of Germany, the lower division of the New Red Sandstone, which used to be called the Magnesian Limestone division, is found to be marked by such distinct peculiarities, both in mineral character and in organic contents, that now all geologists have agreed, after Sir Roderick Murchison, to regard it as a distinct natural group, and to call it the Permian.

The fossil contents of the lower division of the New Red Sandstone, in Perm, Saxony, and Mansfeldt, are sufficiently distinct to justify the separation of that system into two groups. In England the organic remains of the red marls and sandstones of this formation would not warrant such a division, but in Perm they are far more nearly related to the coal formation below it, than to the Trias above it. The Permian fossils are, indeed, clearly distinguished from those of the coal, and they are closely related to them.

What gives great interest to the study of the New Red Sandstone, is the fact, that it forms the line of separation between the Primary and the Secondary rocks. The organic remains of the Trias, the upper division of it, are *mesozoic*, or middle life; but those of the Permian are *palæozoic*, or ancient life, or related to the forms of the earliest animals on the globe.

In England, the structure of the Permian rocks may, perhaps, be best studied about the neighbourhood of Shrewsbury. In that region a limy shale contains thin seams of coal, below which there is a sandstone with trap-tuff, quartzy pebbles, and concretions of ironstone, all of which beds seem to be upper parts of the coal measures. Above that limy shale are, a red shale, clayey marl, and a loose yellowish sandstone, containing also some very thin seams of poor coal, all of which beds may be considered as the *foundation* of British Permian. Higher up still are dark red sandstone and shale, having occasionally concretions of dark mottled limestone. These sandstones and shale are again covered by conglomerates, which in some places are so calcareous as to be burnt for lime, but at Alberbury, between Shrewsbury and the Breiddyn Hills, they become nearly a compact, yellow, magnesian limestone. This is in harmony with the character of the Permian on the Continent, where some of the lower strata contain seams of coal.

As the Permians range to the north of England they become more diversified in mineral character, much richer in fossils, and therefore more correct representatives of the Permians of Russia and Thuringia. As they trend from Nottinghamshire to Yorkshire, red marls alternate with sandstones, and overlie the magnesian limestone, and thus present, in sections, a series of beds like those of Saxony and Russia.

I. THE LITHOLOGICAL CHARACTER OF THE PERMIAN.

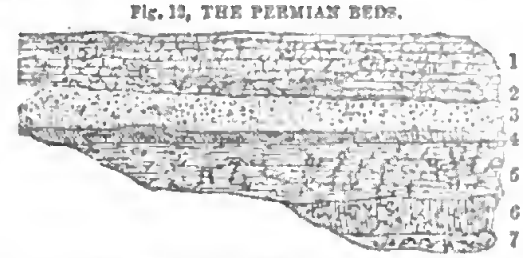
In Russia, the Permian rocks are composed of white limestone with gypsum and white salt, of red and green grits, having occasionally copper ore, and also of magnesian limestones, marlstones and conglomerates.

In England, the Permian consists of limestones, shales, marls and sandstones, which, in their downward order, are arranged by Sir Charles Lyell thus:

No. 1. Crystallica and concretionary limestone.
2. Brecciated limestone.
3. Fossiliferous limestone, called Dolomite.
4. Compact limestone, called the Zechstein.
5. Marl shales, or copper slates, called the Kupferschiefer.
6. The Inferior Sandstone—called the Rothe-todte-liegendo—or the red-dead-lyer.

With these six groups, Sir Roderick Murchison has united the lower portion of the Bunter Sandstein, which is the lowest member of the Trias, and which was described in our last lesson.

Fig. 13, THE PERMIAN BEDS.



No. 1. *Crystalline and Concretionary Limestone.* 2. *Brecciated Limestone.* 3. *Dolomitic Limestone.* 4. *Compact Limestone.* 5. *Marl Slate.* 6. *Rothetodteliegende.* 7. *The Bristol Conglomerates.*

No. 1. THE CRYSTALLINE AND CONCRETIONARY LIMESTONE.

The lithological character of this concretionary limestone is well developed in the Yorkshire and Durham cliffs between the rivers Wear and Tees. Indeed the whole cliff on the Durham coast is made up of large concretional clusters, like piles of cannon balls. This rock varies exceedingly in mineral structure; in some cliffs on the Durham coast it is not crystalline

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at all, but contains forty-four per cent. of carbonate of magnesia combined with carbonate of lime. In other places it consists chiefly of the carbonate of lime which has concreted into globular pieces, varying from the size of a boy's marble to that of a cannon ball, which, when broken, are found to radiate from the centre. There are, however, districts in which some earthy and powdery beds of this rock pass into compact limestone, or into hard granular Dolomite.

No. 2. THE BRECCIATED LIMESTONE.

You will remember that if *rounded* pebbles be cemented into a hard mass, it is called a *conglomerate*, but if the rocky fragments cemented be angular and not water-worn, the mass is called a BRECCIA.

The fragments which form the cemented breccia in the magnesian limestone, are not from remote and different rocks, but consist of pieces of this very limestone itself. Some of these angular fragments are, as at Tynemouth, good two feet in diameter. These fragments never appear water-worn, but seem to have been cemented on the spot where they were broken up, perhaps by atmospheric influences.

No. 3. THE FOSSILIFEROUS LIMESTONE.

The bed of this fossiliferous limestone is sometimes called the upper Zechstein, and the rock of which it is composed is called Dolomite, from M. Dolomieu, a French geologist, who was the first to mark its lithological character.

It is a stratum of great extent and thickness, and it contains a large proportion of magnesia, which is probably the reason why the yellow limestone in Durham, so abundantly charged with magnesia as to form a true dolomite, gave the name of *the* magnesian limestone to this bed wherever it was found.

This true dolomite rock consists of a granular, crystalline, and limy stone, but instead of being pure lime, it is often more than half carbonate of magnesia. In England, the lines of stratification in this rock are generally distinct and clear. In a fresh quarry, the structure of the rock looks perfectly granular, and has a glimmering lustre, like a sugar-loaf fresh cut. The rock has different colours in different places; for when it is infiltrated with hydrate of iron it is pale fawn or yellow; but when with oxide of iron, it is red.

Sometimes this division has beds of very hard stone, and supplies the best building materials in England. The outside of the New Houses of Parliament in London are built of dolomite, or magnesian limestone.

No. 4. THE COMPACT LIMESTONE, CALLED THE LOWER ZECHSTEIN.

In mineral character this bed is much the same with No. 3, for, as far it is developed in Nottinghamshire, Yorkshire, and Durham, it consists of yellow magnesian limestone. In Russia, it is a mere subordinate member of vast beds of rocks containing copper; but in Germany, to the south of the Hartz mountains, and in Thuringia, it consists of enormous masses of limestone and gypsum.

No. 5. THE MARL SLATE.

The marl slate is called by the Germans, Kupferschiefer, or copper shales, and consists of hard, limy slates, marl shales, and thin seams of limestone. In England, these red marls and sandstones extend from the neighbourhood of Nottingham to the southern parts of Northumberland, and at East Thickley, in Durham, it is thirty feet in depth. About Mansfeldt in Thuringia, this marlstone is richly impregnated with copper pyrites (pu-ry-tes), for which it is extensively worked. This is the reason why the Germans call this bed *copper shale*. At Eisleben, the native place of *Luther*, this stratum furnishes fossil fish in the most beautiful condition, having their bodies splendidly covered with copper pyrites, and even their scales, appear as if turned into burnished gold.

No. 6. THE INFERIOR SANDSTONE.

The German miners call this inferior sandstone by the hard name of Rothe-todte-lie-gendes—the *red*-dead-lyer. It is thus called, partly because of its *red* colour, and partly because the copper pyrites *lie* out when the miners dig down into this *under-lying* bed. The German miners call it briefly *Rothliegendes*.

This rock consists of sandstone and sand, which, in Yorkshire and Durham, separates the Permian system from the coal formation. It is better known in England by the name of the "Pontefract stone," which consists of yellowish sandstone and conglomerates, and containining various fossil plants.

The precise relationship of these sandstones to the Permian and to the coal measures is not yet well defined, but as such sandstones are nearly co-extensive with the Permian, they are generally classed with it.

No. 7. THE DOLOMITE CONGLOMERATES OF BRISTOL.

In some of the English counties bordering on the Severn north and south of Bristol, a low bed of the Permians rests immediately but not conformably upon the coal measures. It is a bed of pebbles called dolomite, consisting of fragments of older rocks cemented together by a red or yellow base of magnesian or dolomitic limestone. It is sometimes a conglomerate and sometimes a breccia. This bed is in patches, stretching over the whole of the downs near Bristol, and is found filling up the hollows in the mountain limestone. It is composed principally, at every spot, of the ruins of the rocks on which it rests, such as coal shale, millstone grit, mountain limestone. This may be advantageously studied in the valley of the Avon near Clifton, where the coal strata are seen to overlie the mountain limestone.

II. THE FOSSIL REMAINS OF THE PERMIAN.

1. The fossil contents of the Permian rocks have this interest, that they present specimens of the last types of organic life, which had prevailed from the earliest epoch in the history of our globe. There are 166 species of plants and animals in the Permian, which have been accurately determined, and of these 148 are unknown in any other formation. Though these deposits are exceedingly diversified in their mineral aspect, they are all marked by one type only of animal and vegetable organisms, and that is essentially palæozoic. On this account, the Permian ranks as the uppermost, or the newest, group of the palæozoic rocks.

2. In the Permian rocks of Saxony, sixty species of fossil plants have been found, of which several are common to the coal measures, but forty of them are never found elsewhere.

3. The bed of crystallina limestone, No. 1, has for its chief characteristic the fossil shells *Schizodus Schlotheimi*, and *Mytilus septifer*, which are found about Hartlepool and Sunderland.

4. The dolomitic limestone, No. 3, abounds with the delicate coral called *Fenestella retiformis*. It has also shells of the genera *Spirifer* and *Productus*, which are not found in any stratum above the Permian, but are abundant in this division of what used to be called the yellow magnesian limestone.

5. The marl slate, No. 5, has furnished fine specimens of several fossil fish, called the *Palæoniscus*, *Pygopterus*, *Colacanthus*, and *Platysomus*—all of which are found in the older and the underlying rocks, the coal measures; and yet the Permian *species* of these fish are peculiar, and vary from those of the coal rocks.

One mode of distinguishing fish is by the fin which forms their tails. In one tribe, as in the shark and the sturgeon, the back-bone of the fish is continued to the upper lobe or division of the tail. This tribe is called Heterocercal. In another tribe, like the herrings the back-bone does not enter either lobe of the tail, but the fin of the tail is equally divided. This tribe is called Homocercal. These two tribes are represented in the following engraving, fig. 13.

6. The plants of the marl slate, No. 6, has not, as yet, their relations well determined. In some regions they are supposed to be, in species, identical with those of the coal measures; and, in that case, they ought properly to be referred to that epoch; but the *true* Permian plants appear, from Sir Roderick Murchison's work on Russia, to be in species quite distinct from those of the coal.

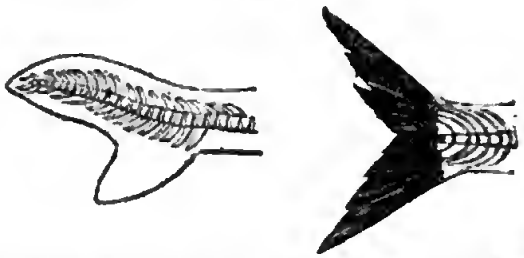
7. The Zechstein of Thuringia has furnished the fossil remains of a saurian, or lizard, called the *Protorosaurus*, a reptile nearly allied to a monster of the living creation, called *Monitor*

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8. In the dolomitic conglomerates at Redland near Bristol, the remains of two distinct species of saurians, or lizards, have been found. One species is called the Thecodontosaurus, on account of its *teeth* being implanted in distinct sockets, like the crocodile; and the other is called the Palæosaurus, the ancient lizard. These are also found in the Permian rocks of Russia.

9. The most remarkable fossil plants of the Rothe-todtelie-gende, in Bohemia and Saxony, are the silicified trunks of tree ferns, of the genus called *Psaronius*. Their bark is surrounded by a thick mass of air-roots which greatly strengthens

Fig. 13.



Heterocercal Tail—The Shark. Homocercal Tail—The Herring.

the stem, and doubles and sometimes even quadruples its diameter. These *Psaronites* are found in the upper coal seams of Autun, in France, and also in the upper coal strata of the State of Ohio, North America; but all these are of a species different from those of the Rothetodteliegendo.

III. SOME GEOLOGICAL PHENOMENA OF THE PERMIAN.

1. Some of the beds of the concretionary limestone are ripple-marked, and the casts of shells which are found in it, together with the complete absence of corals, indicate that the rock was formed in shallow water.

2. Though the lines of stratification in the limestone are generally regular and clear, yet there are instances in which the stratification is obliterated by the process of concretionary action, which seems to have re-arranged the materials of the rock *after* they had been deposited, and to have thereby destroyed the lines of stratification. This may be seen in the cliffs at Pontefract and Ripon in Yorkshire.

3. The concretionary masses in the dolomite limestone furnish a beautiful illustration of the manner in which spherical bodies are formed by chemical action—an action introduced into stratified detritus after its deposition. It is remarkable that, notwithstanding the concretionary action, the lines of the original lamination or seams continue to pass through the spheroidal or oval masses. This is evident, as the limestone is commonly traversed by veins and strings of carbonate of lime.

4. The fossiliferous limestone bed, No. 3, is supposed, from the delicate corals which abound in it, to have been a deep water formation.

5. The marl slates abound with Heterocercal fish. This form, in the fish of the present day, is exceedingly limited; but it was almost universal in the Permian period, and in all the ancient formations. This type, therefore, characterises the earliest periods of our earth's history, when the organisation of fish was much more like lizard reptiles than now.

You will remember that in all the rocks *above* the Permian the homocercal tail prevails.

6. The fossil fishes contained in the Permian are most generally found curved or contorted, which seems to indicate the violent convulsion that attended their sudden death. Agassiz (A'gassi), however, thinks that their curved state is to be attributed to muscular contraction during decomposition, after life was extinct.

7. The earliest *certain* indications of the existence of reptiles upon our globe are supplied by the Permian system; for in the more ancient formations, no teeth or bones of any higher animals than fishes have yet been discovered.

Two circumstances seem to come into collision with this statement, namely, the impressions of the feet of quadrupeds having been discovered in the mountain limestone of Pennsylvania, and the skeleton of a saurian, four feet long, having been found in a rock of the carboniferous age in Germany.

8. The appearance, in a palæozoic formation, of the lizard fish called the Protorosaurus, a reptile allied to our present *Monitor*, is, as Professor Owen has shown, opposed to the doctrine of the progressive development of reptiles from fish, or from simpler forms to more complex organisation; for if the Protorosaurus were now in existence, it would be at *the head* of the order of lizards.

BIOGRAPHY.—No. XV.

PITT.

By J. R. Beard, D.D.

The eloquence of the British senate has no parallel. Greece had but one Demosthenes, and Rome produced no orator comparable with Cicero. But England may boast of a succession of statesmen, who to profound wisdom and the highest administrative skill united the most brilliant and powerful eloquence. Foremost among these truly great men, to whom is largely to be ascribed the high and indomitable spirit of Englishmen in peace and in war, stands William Pitt, Earl of Chatham, sometimes distinguished as "the elder Pitt," eminent alike for ability and character.

William Pitt, the son of a private gentleman, by name Robert Pitt, of Boconnoc, Cornwall, was born on the 15th of November, 1708. He received a classical training at Eton and Oxford, and by his abilities and love of country early excited great expectations. In the year 1735 he entered parliament as member for Old Sarum, a rotten borough dependent on his family. His friends, out of their scanty means, had purchased for him a cornet's commission in the cavalry. He lost the post in consequence of supporting in his place in parliament an increase in the provision for the Prince of Wales. His persecution called his eloquence into fuller play, and nerved his patriotic soul. He soon obtained in parliament and among the people so predominant an influence, that the court saw it prudent to bestow on him an office. He became (1746) Treasurer for Ireland, and shortly afterwards was appointed Paymaster-General of the Forces. At this time, the Duchess of Marlborough, pleased with the patriotism of the daring orator, presented him with an estate worth £10,000. A similar piece of good fortune fell to him on similar grounds at a later period. When, in 1735, Fox became Secretary of State in place of Robinson, Pitt laid down his office, as he found himself in strong opposition with the policy of the new minister. He was not, indeed, averse to either the war against France or the treaty with Prussia, but he wished that therein the interests of England alone should be regarded; while George II. was solicitous for his German possessions, and contemplated sending troops to Hanover. In 1756, the king, yielding to the wishes of the nation, dismissed Fox. Thereupon Pitt succeeded as Secretary of State, and conducted the war according to his own comprehensive plan. He formed a national militia, called out the energies of the British people, and directed them to their own peculiar sphere, the ocean, with the view of effecting a landing on the French territory. To this course the king was opposed. Pitt, therefore, surrendered the seals of office in April, 1757. In the June ensuing, he again received them from his royal master's hands, for the stirring requests of the people were irresistible; and the war in Hanover, under the Duke of Cumberland, went on badly. Pitt at once became the soul of the cabinet. His great aim was to debilitate France and make England powerful. His bold and kindling eloquence obtained for him a controlling sway over the legislature. He showed the people that the strength of the British nation lay in its naval force. He proved that the great industrial population of the three kingdoms could be free, rich, and secure only when trade flourished, and the fleet ruled the waves. His policy was so simple and straightforward, that the people rose to their former self-confidence, and put forth gigantic efforts which eventually overcame all opposition. Pitt not only succeeded in defeating the policy of France and Spain, but applied his great powers to oppose the unjust and disastrous war undertaken by England against her North American colonies, employing the most vivid and rapturous

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eloquence to disabuse the public mind and alter the course of government. His counsels at length prevailed. Most deservedly was he raised to the peerage, under the title of Viscount Pitt and Earl of Chatham. In the long and arduous conflicts through which he went, his health had greatly suffered. He was a martyr to the gout. In consequence his appearance in the house was irregular. Yet would he not allow the infirmities of the body to prevent his discharging the high offices of patriotism and philanthropy. Actuated by wise and resistless benevolence, he for the last time—as it proved—took his seat in parliament on the 7th of April, 1778, and spoke with great energy against the policy of the minister; but when he wished to address the house again, after a speech from the Duke of Richmond, he was so overpowered by his emotions that he fell on the floor in convulsions. Great consternation arose. He was conveyed to his home at Hayes, in Kent, where he departed this life on the 12th of May, 1778. The excellent Lord Camden was present at his death. As Socrates in his last hours philosophised with his friends, so did Chatham speak with Camden on the interests of his country when life was ebbing fast. At length Chatham said, while his friend pressed his cold hand—"Dear Camden, save my country." A few moments after, his great soul fled. His demise excited in all classes an indescribable sensation. Crowds pressed to London to see his body lying in state. His remains were conveyed to Westminster Abbey. The nation, besides paying Chatham's debts, amounting to £20,000, settled on his family an annuity of £4,000. He left three sons and two daughters. His second son was the celebrated or younger William Pitt, who, treading in his father's footsteps, pursued a policy whose triumph was celebrated on the field of Waterloo.

Chatham's eloquence was one of those rare things which can be described only by the epithet miraculous; such was the power of its inspiration, the nobility of its author's soul, the fire of his eyes, the grandeur of his look in lofty passages, and its withering aspect in sarcasm, the grace of his action, the music of his voice and the moral force of his high and earnest character. His eloquence had its source in those natural ideas and sympathies, which are alike resistless and undecaying, which specially characterise the eloquence of the great masters of old, and without which oratory degenerates into an idle play of speech-making, or a degraded trade of misrepresentation.

Further information may be found in the "History of the Life of William Pitt, Earl of Chatham," 1783; "Anecdotes of the Life of the Right Honourable William Pitt, Earl of Chatham, and of the principal events of his times, with his Speeches in Parliament, from the year 1706 to 1778," London, 1792; "Letters written by the late Earl of Chatham to his nephew, Thomas Pitt, Esq., afterwards Lord Camelford," 3rd edition, London, 1804; "History of the Right Honourable William Pitt, Earl of Chatham, by Francis Thackeray," London, 1824.

The character of the Earl of Chatham's oratory may be judged of by the following fine burst of eloquence

ON AMERICAN AFFAIRS.

"I cannot, my lords, I will not, join in congratulation on misfortune and disgrace. This, my lords, is a perilous and tremendous moment; it is not a time for adulation; the smoothness of flattery cannot save us in this rugged and awful crisis. It is now necessary to instruct the throne in the language of truth. We must, if possible, dispel the delusion and darkness which envelop it; and display, in its full danger and genuine colours, the ruin which is brought to our doors. Can ministers still presume to expect support in their infatuation? Can parliament be so dead to its dignity and duty, as to give their support to measures thus obtruded and forced upon them? measures, my lords, which have reduced this late flourishing empire to scorn and contempt! But yesterday, and England might have stood against the world; now, none so poor as to do her reverence. The people, whom we at first despised as rebels, but whom we now acknowledge as enemies, are abetted against us, supplied with every military store, their interest consulted, and their ambassadors entertained by our inveterate enemy; and ministers do not, and dare not, interpose with effect. The desperate state of our army abroad is in part known. No man more highly esteems and honours the English troops than I do: I know their virtues and their valour; I know they can achieve anything but impossibilities; and I know that the conquest of English America is an impossibility. You cannot, my lords, you cannot conquer America. What is your present situation there? We do not know the worst; but we know that in three campaigns we have done nothing, and suffered much. You may swell every expense, accumulate every assistance, and extend your traffic to the shambles of every German despot; your attempts will be for ever vain and impotent;—doubly so, indeed, from this mercenary aid on which you rely; for it irritates, to an incurable resentment, the minds of your adversaries, to overrun them with mercenary sons of rapine and plunder, devoting them and their possessions to the rapacity of hireling cruelty.

"But, my lords, who is the man that, in addition to the disgraces and mischiefs of the war, has dared to authorise and associate to our arms the tomahawk and scalping-knife of the savage? to call into civilised alliance the wild and inhuman inhabitants of the woods? to delegate to the merciless Indians the defence of disputed rights, and to wage the horrors of his barbarous war against our brethren? My lords, these enormities cry aloud for redress and punishment. But, my lords, this barbarous measure has been defended, not only on the principles of policy and necessity, but also on those of morality; for, 'It is perfectly allowable,' says Lord Suffolk, 'to use all the means which God and nature have put into our hands.' I am astonished, I am shocked, to hear such principles confessed; to hear them avowed in this house, or in this country. My lords, I did not intend to encroach so much on your attention; but I cannot repress my indignation—I feel myself impelled to speak. My lords, we are called upon as members of this house, as men, as Christians, to protest against such horrible barbarity! 'That God and nature have put into our hands!' What ideas of God and nature that noble lord may entertain, I know not; but I know, that such detestable principles are equally abhorrent to religion and humanity. What! to attribute the sacred sanction of God and nature to the massacres of the Indian scalping-knife! to the savage, torturing and murdering his unhappy victims! Such notions shock every precept of morality, every feeling of humanity, every sentiment of honour. These abominable principles, and this more abominable avowal of them, demand the most decisive indignation. I call upon that right reverend, and this most learned Bench, to vindicate the religion of their God, to support the justice of their country. I call upon the bishops to interpose the unsullied sanctity of their lawn; upon the judges to interpose the purity of their ermine, to save us from this pollution. I call upon the honour of your lordships, to reverence the dignity of your ancestors, and to maintain your own. I call upon the spirit and humanity of my country, to vindicate the national character. I invoke the genius of the Constitution. From the tapestry that adorns these walls, the immortal ancestor of this noble lord frowns with indignation at the disgrace of his country. In vain did he defend the liberty, and establish the religion of Britain against the tyranny of Rome, if these worse than Popish cruelties and inquisitorial practices are endured among us. To send forth the merciless Indians, thirsting for blood! against whom?—your protestant brethren! to lay waste their country, to desolate their dwellings and extirpate their race and name, by the aid and instrumentality of these horrible bell-hounds of war! Spain can no longer boast pre-eminence in barbarity. She armed herself with bloodhounds to extirpate the wretched natives of Mexico; we, more ruthless, loose these brutal warriors against our own countrymen in America, endeared to us by every tie that can sanctify humanity. I solemnly call upon your lordships, and upon every order of men in the state, to stamp upon this infamous procedure the indelible stigma of the public abhorrence. More particularly, I call upon the venerable prelates of our religion, to do away with this iniquity; let them perform a lustration to purify the country from this deep and deadly sin.

"My lords, I am old and weak, and at present unable to say more; but my feelings and indignation were too strong to have allowed me to say less. I could not have slept this night in my bed, nor even reposed my head upon my pillow, without giving vent to my steadfast abhorrence of such enormous and preposterous principles."

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LESSONS IN FRENCH PRONUNCIATION.

No. VII.

72. LIQUIDS.

L and LL.

Whenever L and LL are preceded by AI, EI, OUI, and sometimes by I only, they receive a sound very different from that which they have when *initial*. In the former case, they become Liquid, and are so called from their peculiar sound. Yet it is a sound with which foreigners are well acquainted. The only difficulty is, in *expressing* or *illustrating* the sound by means of English analogous sounds.

It is the same sound which is given to the letters LLI in the correct pronunciation of the English words COLLIER, BILLIARD, BRILLIANT, and WILLIAM. If you pronounce any one of these words very carefully, observing at the same time the peculiar sound of the letters LLI, you will have the correct Liquid sound which is illustrated by the peculiar sound of the letters GL, in the English word SERAGLIO.

In French words containing Liquid sounds, observe the following General Rules, viz.:—

I.

Pronounce the letter A before IL and ILL, as A in the English word AH!

II.

Pronounce the letter E before IL and ILL, as A in the English word DAY.

In the illustrated pronunciation of the following examples of Liquid sounds, the last syllable YE of many of them, is scarcely sounded. Let it be but the mere faint echo of the voice.

Name.	Sound.
GL.	Like the letters GL in the English word SERAGLIO.

French.	Pronunciation.	English.
Accueil	A-kneegl-ye or k weegl-ye	*Reception.*
Brûler	Breegl-yay	*To brighten.*
Castille	Kas-ugl-yo	*Contention.*
Dépouille	Day-poo-eegl-yo	*Relics.*
Enorgneillir	Anh!-nor-gneegl-yeer, or g'weegl-yeer	*To be proud of.*
Famille	Fa-migl-ye	*Family.*
Feuille	Fuhligl-ye	*Paper, or a sheet of paper.*
Fille	Feegl-ye	*Daughter.*
Mouiller	Moo-eegl-yay	*To wet.*
Oreille	O-raygl-ye	*Ear.*
Paille	Pah-eegl-ye, or pahgl-ye	*Straw.*
Ponillor	Poo-eegl-yay	*To abuse.*
Réveil	Ray-vaygl-ye	*Alarm-clock.*
Sillon	Sigl-yonh!	*Furrow.*
Soleil	So-laygl-ye	*Sun.*
Tailleur	Tahgl-yuh!r, or Tah-eegl-yuh!r	*Tailor.*
Tourbillon	Toor-bigl-yonh!	*Whirlwind.*
Travail	Tra-vahgl-ye, or Tra-vah-eegl-ye	*Labour.*

But there is another very different and common method of pronouncing the Liquid sound illustrated in the preceding examples. Its chief merit is, *the ease with which it may be acquired.* It cannot be stigmatised *as absolutely vicious*, though it be, at least in our opinion, IMALSOANT.

The following examples will be used to illustrate the kind of pronunciation just spoken of, viz.:—

French.	Pronunciation.	English.
Aiguille	A-guee-y'	*Needle.*
Bouilli	Booee-y'	*Boiled Beef.*
Bouteille	Boo-tay-y'	*Bottle.*
Cuiller	Kuee-yeair	*Spoon.*
Fauteuil	Fo-tuhl-y'	*Arm-chair.*
Groseille	Gro-eay-y'	*Currant.*
Muraille	Mu-rah-y'	*Wall.*

Speaking of these different methods of pronouncing the Liquids, the following opinion is taken from BOLMAR'S LEVIZAC'S FRENCH GRAMMAR, viz.:—

"This last pronunciation being the easiest of the two, has been adopted by so many people in France, that it is no longer considered a fault, except by grammarians. However, I recommend the former, not only on account of its correctness, but also on account of its being a sound very common to the Spanish, the Italian and Portuguese languages; in which languages this sound does not admit of any variation. It is represented in the Spanish by *ll*, in the Italian by *gli*, and in the Portugese by *lh*."

GN.

This Liquid is much used in the French language. Its correct sound is peculiar, delightful, and by no means difficult to obtain. It is the sound of the letters GN, in the English words BAGNIO, MIGNIONETTE and VIGNETTE. It may be represented also by the letters NI in the English words MINION, ONION, PINION and UNION.

Pronounce the word MIGNIONETTE correctly and carefully; observing, at the same time, the peculiar sound of the letters GN; pronounce also the word PINION, observing the sound of the letters NI. Give to GN in the following examples the sound of GN in the word *mignionette*, or of NI in the word *pinion*, which will be the correct sound of this Liquid.

French.	Pronunciation.	English.
Bagne	Bagn	*Galley.*
Baigné	Bay-gnay	*Bathed.*
Biguonie	Bee-gno-nee	*Trumpet-flower.*
Digne	Deegn	*Worthy.*
Dignitaire	Dee-gnee-tair	*Dignitary.*
Dignité	Dee-gnee-tay	*Dignity.*
Epargne	Ay-parga	*Economy.*
Gagner	Ga-gnay	*To earn.*
Peigne	Paygn	*Comb.*
Régnant	Ray-gnanh!	*Reigning.*
Signe	Seegn	*Sign.*
Soigner	S'wah-gnyay	*To attend to.*
Vigneron	Veegn'-ronh!	*Vine-dresser.*

The exceptions to this method of pronouncing the letters GN occur only in these words, in which they belong to different syllables;—that is to say, in dividing those words into syllables, it would be found that G belonged to one syllable, and N belonged to the next succeeding syllable, viz.:—

French.	Pronunciation.	English.
Igné	Ig-nay	*Igneous.*
Ignescent	Ig-nays-sanh!	"
Ignicole	Ig-ne-kol	*Fire-worshipper.*
Ignition	Ig-ne-seonh!	*Ignition.*
Ignivome	Ig-ne-vom	*Fire-vomiting.*
Ignivore	Ig-ne-vor	*Fire-eating.*
Magnificat	Mag-ni-fe-kat	*Name of a sacred hymn.*
Regnicole	Raig-ne-kol	*A native.*
Stagnant	Stag-nanh!	*Stagnant.*
Stagnation	Stag-nah-seonh!	*Stagnation.*

To the above may be added a few Proper Names.

GENERAL RULES FOR PRONOUNCING AND READING FRENCH.

73. The preceding lessons have been devoted exclusively,—and it is hoped satisfactorily,—to the illustration of every known French sound, whether occurring singly, or the result of combinations of Vowels, Consonants, Compound Vowels, Diphthongs, Nasals and Liquids. ANALOGOUS ENGLISH sounds have constituted the agents of the foregoing illustrations of French sounds. Generally, this has had reference to SEPARATE WORDS, only. But, let it be remembered, that to give the correct sound of a French word, AS IT STANDS ALONE, is a very different thing from giving that same French word its correct sound, when it is used with other words in the formation of a sentence in reading, or a phrase in conversation.

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In this respect, the French language is like our own, as used in common conversation. The system of WORD-CONNECTIONS, in sentences and phrases in both languages, is nearly identical. For the purpose of illustration, we will begin by giving specimens of WORD-CONNECTIONS in the English language, viz.:—

My hat was on the table,—is pronounced as if printed—*My hat wez-zon the table.*

I jumped upon the ground,—is pronounced as if printed—*I jumpt-tup-pon the ground.*

Not at all,—is pronounced as if printed—*Not-tat-tall.*

I assert a dogma; another denies it,—is pronounced as if printed—*I assert-ta dogma; another denies-sit*, etc.

These and similar WORD-CONNECTIONS occur in almost every sentence and phrase in the English language, *where the continuity of sound is not broken by punctuation marks*, without our being sensible of it. *It is unavoidable.* We are, and have been, so constantly used to it, that we notice it only when attention is called to it. It will be observed that the foregoing WORD-CONNECTIONS in the English language occur, when a word ending with a Consonant is immediately followed by another word commencing with a Vowel. And the same exists, when, in common conversation, the word following the one with a final Consonant, begins with a silent H, viz.:—

I was out about an hour—is pronounced as if printed—*I waz-wut-tabout-tan-nour*, etc.

WORD-CONNECTIONS in the French language also occur under circumstances exactly similar; *i. e.* when a word ending with a Consonant immediately precedes another word commencing with a vowel or silent H.

This feature, therefore, of the pronunciation of French, both in ordinary reading and common conversation, will present no great difficulty to the student. The following Rules, thoroughly understood and committed to memory, will place the student beyond doubt and hesitation concerning these WORD-CONNECTIONS, and other matters pertaining to the correct, intelligible use of the French language, both in READING and CONVERSATION.

I.

Pay no attention whatever to the Apostrophe.

II.

Pronounce ELLE, like the English L.

III.

The final letters ENT of Verbs with which ILS and ELLES do or can agree, are always silent.

IV.

In reading poetry, IA, IE, IE', IO, ION, IER, and sometimes IEN, are pronounced as two syllables.

V.

ES final, are pronounced like the letters AY, in the English word DAY, except when S forms the plural of words ending in E; in which latter case, ES are not pronounced.

VI.

Pronounce EUX, Œ, and ŒU, like E mute or unaccented.

VII.

Pronounce CH and SCH generally, like the letters SH, in the English word FISH, except the letters CH in the word YACHT.

VIII.

ST final, in the words CHRIST and ANTICHRIST, are always silent.

IX.

All final Consonants after R are silent; except in the words MARS, and OURS—*a bear.*

X.

In the word MESSIEURS, the final letters RS are never pronounced.

XI.

Whenever a word ending with a Consonant immediately precedes a word beginning with a Vowel or silent H, the sound of the final Consonant of the former word is carried to the first syllable of the latter, or to the word itself, if it be a monosyllable, just as if the latter word commenced with that Consonant. This is most particularly the case, if the two words are intimately connected in sense.

The above Rule owes its existence entirely to Euphony; to subserve which, almost everything else is sacrificed in the French language. Still the student must not observe it *too rigidly*, except in poetry. Neither in prose nor conversation, does this Rule hold good in the following cases, viz.:—

1. When a *harsh sound* would be the consequence.
2. Whenever any punctuation mark *is placed between* the two words in question.

XII.

T, in the words ET—a conjunction meaning *and*—and CENT—meaning a *hundred*—is never carried to the following word in pronunciation.

XIII.

A, in the word AOÛT, is not generally sounded. Sometimes, however, it is pronounced, but it is considered *incorrect.*

This word, AOÛT—meaning *August* (*the month*), is pronounced OO, and not AH-OO.

XIV.

In the Compound word EST-IL, and a few others, the T is carried to the second syllable in pronunciation.

XV.

Whenever a word ending with a silent E is immediately followed by another word beginning with a Vowel or H mute, the Consonant preceding the silent E of the first word is carried to the next word in pronunciation, viz.:—

LA FRANCE ENTIÈRE; as if printed
LA FRAN-CENTIÈRE, and pronounced,
Lah Franhl-sanhl-teair.

HONNÊTE HOMME; as if printed
HONNÊ-TOMME, and pronounced,
On-nay-tom.

XVI.

With the words AH! EH! OH! OUEST,—one of the points of the compass—OUF! OUI, ONZE, ONZIÈME, PHO! UNIÈME, YACHT, YATAGAN, YOLE and YUCCA, no final Consonant of a preceding word is connected in pronunciation. Neither is any elision of the Article made before any of these words.

XVII.

In the phrase VERS LES UNE HEURE, the S final of the second word—LES—is not carried to the following word—UNE—in pronunciation.

XVIII.

CINQ, is pronounced *sanh!*, whenever it comes before a Consonant or an Aspirated H. But before a Vowel or H mute, it is pronounced *sanh'k.*

XIX.

UE, have the sound of U, when they are not silent after G and Q.

XX.

DIX,—*ten*,—before a Consonant, is pronounced DEE; before a Vowel or H mute, DEEZ; and at the end of a clause, as DEESS.

XXI.

SIX,—*six*,—before a Consonant, is pronounced SEE; before a Vowel or H mute, SEEZ; and at the end of a clause, as SEES.

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XXII.

HUIT,—*eight*,—before a Consonant is pronounced UEE, or nearly WEE; before a Vowel or H mute, as UEET, or nearly WEET.

XXIII.

ER final, is usually pronounced like the letters AY, in the English word DAY. The following words, however, constitute an exception to the above Rule. In them, ER is pronounced like AIR in English.

Alger	Fier	Magister
Amer	Frater	Mer
Belvéder	Gastec	Niger
Caneer	Gessner	Pater
Cher	Hier	Sadder
Cuiller	Hiver	Stathouder and
Enfer	Jupiter	Ver.
Fer	Lucifer	

XXIV.

Divide each word *naturally* into syllables, as you would in the English language.

LESSONS IN ITALIAN GRAMMAR.—No. XL.

Thirdly.—Verbs in *urre*, contracted from *ere*.

Addúrre, to bring.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *addúrre*, to bring	Past: *avére addótto*, to have brought
Present Gerund: *adducéndo*, bringing	Past Gerund: *avéndo addótto*, having brought
Past Participle: *addótto*, brought	

INDICATIVE MOOD.

Present.

Addúco, I bring
addúci, thou bringest
addúce, he brings
adducidmo, we bring
adducéte, you bring
addúcono, they bring

Imperfect.

Adducéva or *adducéa*, I was bringing
adducévi, thou wast bringing
adducéva or *adducéa*, he was bringing
adducevámo, we were bringing
adducevéte, you were bringing
adducévano or *adducéano*, they were bringing

Indeterminate Preterite.

Addússi, I brought
adducésti, thou broughtest
addússe, he brought
adducémmo, we brought
adducéste, you brought
addússero, they brought

Future.

Addurrò, I shall or will bring
addurrái, thou wilt bring
addurrà, he will bring
addurrémo, we will bring
addurréte, you will bring
addurránno, they will bring

Conditional Present.

Addurréi or *addurría*, I should or would bring
addurrésti, thou wouldst bring
addurrébbe or *addurría*, he would bring
addurrémmo, we would bring
addurréste, you would bring
addurrébbero or *addurríano*, they would bring

IMPERATIVE MOOD.

[No First Person.]
Addúci, bring (thou)
addúca, let him bring
adduciámo, let us bring
adducéte, bring (ye or you)
addúcano, let them bring

SUBJUNCTIVE MOOD.

Present.

Che addúca, that I may bring
che addúca or *addúchi*, that thou mayst bring
che addúca, that he may bring
che adducidmo, that we may bring
che adducéte, that you may bring
che addúcano, that they may bring

Imperfect.

Che adducéssi, that I might bring
che adducéssi, that thou mightst bring
che adducésse, that he might bring
che adducéssimo, that we might bring
che adducéste, that you might bring
che adducéssero, that they might bring

So conjugate—

Infinitive.	Indet. Pret.	Future.	Past Part.	English.
Condúrre,	*condússi*,	*condurrò*,	*condótto*,	to conduct
Dedúrre,	*dedússi*,	*dedurrò*,	*dedótto*,	infer
Indúrre,	*indússi*,	*indurrò*,	*indótto*,	induce
Introdúrre,	*introdússi*,	*introdurrò*,	*introdótto*,	lead in
Prodúrre,	*produssi*,	*produrrò*,	*prodótto*,	produce
Ricondúrre,	*ricondússi*,	*ricondurrò*,	*ricondótto*,	lead back
Ridúrre,	*ridússi*,	*ridurrò*,	*ridótto*,	reduce
Sedúrre,	*sedússi*,	*sedurrò*,	*sedótto*,	seduce
Tradúrre,	*tradússi*,	*tradurrò*,	*tradótto*,	translate

Fourthly.—Verbs ending in *gere*.

Vólgere, to turn.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *vólgere*, to turn	Past: *avére vólto*, to have turned
Present Gerund: *volge'ndo*, turning	Past Gerund: *avéndo vólto*, having turned
Past Participle: *vólto*, turned	

INDICATIVE MOOD.

Present.

Vólgo, I turn
vólgi, thou turnest
vólge, he turns
volgiámo, we turn
volge'te, you turn
vólgono, they turn

Imperfect.

Volge'va or *volge'a*, I was turning
volge'vi or *volge'i*, thou wast turning
volge'va or *volge'a*, he was turning
volgevámo, we were turning
volgevéte, you were turning
volge'vano, they were turning

Indeterminate Preterite.

Vólsi, I turned
volse'sti, thou turnedst
volse, he turned
volge'mmo, we turned
volge'ste, you turned
vólsero, they turned

Future.

Volgerò, I shall or will turn
volgerái, thou wilt turn
volgerà, he will turn
volgeré'mo, we will turn
volgeré'te, you will turn
volgerámno, they will turn

Conditional Present.

Volgeréi or *volgería*, I should or would turn
volgeré'sti, thou wouldst turn
volgere'bbe, he would turn
volgeré'mmo, we would turn
volgeré'ste, you would turn
volgere'bbero, they would turn

IMPERATIVE MOOD.

[No First Person.]
Vólgi, turn (thou)
vólga, let him turn
volgiámo, let us turn
volge'te, turn (ye or you)
vólgano, let them turn

SUBJUNCTIVE MOOD.

Present.

Che vólga, that I may turn
che vólga, that thou mayst turn
che vólga, that he may turn
che volgiámo, that we may turn
che volgiáte, that you may turn
che vólgano, that they may turn

Imperfect.

Che volge'ssi, that I might turn
che volge'ssi, that thou mightst turn
che volge'sse, that he might turn
che volge'ssimo, that we might turn
che volge'ste, that you might turn
che volge'ssero, that they might turn

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So conjugate—

Infinitive.	Present.	Indet. Pret.	Past Part.	English.
Aggiúngere,	*aggiúngo,*	*aggiúnsi,*	*nggiúnto,*	to add
Aspe'rgere,	*aspe'rgo,*	*aspe'rsi,*	*aspe'rso,*	sprinkle
Astè'rgere,	*astè'rgo,*	*astè'rsi,*	*astè'rso,*	cleanse a wound
Astríngere,	*astríngo,*	*astrínsi,*	*astre'tto,*	press
Attíngere,	*attíngo,*	*attínsi,*	*attínto,*	draw
Avvólgere,	*avvólgo,*	*avvólsi,*	*avvólto,*	turn
Cíngere,	*cíngo,*	*cínsi,*	*cínto,*	gird
Compiángere,	*compiángo,*	*compiánsi,*	*compiánto,*	pity
Compíngere,	*compíngo,*	*compínsi,*	*compínto,*	afflict
Congiúngere,	*congiúnge,*	*congiúnsi,*	*congiúnto,*	join
Convólgere,	*convólgo,*	*convólsi,*	*convólto,*	roll
Consúrgere,	*consúrgo,*	*consúrsi,*	*consúrto,*	grow
Cospe'rgere,	*cospe'rgo,*	*cospe'rsi,*	*cospe'rso,*	sprinkle
Costríngere,	*costríngo,*	*costrínsi,*	*costre'tto,*	compel
Dipíngere,	*dipíngo,*	*dipínsi,*	*dipínto,*	describe
Discíngere,	*discíngo,*	*discínsi,*	*discínto,*	ungird
Disgiúngere,	*disgiúnge,*	*disgiúnsi,*	*disgiúnto,*	disunite
Dispe'rgere,	*dispe'rgo,*	*dispe'rsi,*	*dispe'rso,*	disperse
Eme'rgere,	*eme'rgo,*	*eme'rsi,*	*eme'rso,*	emerge
E'rgere,	*e'rgo,*	*e'rsi,*	*érte* or *ere'tto,*	raise
Fíngere,	*fíngo,*	*fínsi,*	*fínto,*	feign
Frángere,	*frángo,*	*fránsi,*	*fránto,*	break
Giúngere,	*giúnge,*	*giúnsi,*	*giúnto,*	come to
Indúlgere,	*indúlgo,*	*indúlsi,*	*indultò,*	grant
Infríngere,	*infríngo,*	*infránsi,*	*infránto,*	break
Ingiúngere,	*ingiúngo,*	*ingiúnsi,*	*ingiúnto,*	join
Immè'rgere,	*immè'rgo,*	*immè'rsi,*	*immè'rso,*	plunge
Intíngere,	*intíngo,*	*intínsi,*	*intínto,*	dip
Insúrgere,	*insúrgo,*	*insúrsi,*	*insúrto,*	rise against
Mè'rgere,	*mè'rgo,*	*mè'rsi,*	*mè'rso,*	plunge
Múngere,	*múngo,*	*múnsi,*	*múnto,*	milk
Piángere,	*piángo,*	*piánsi,*	*piánto,*	weep
Píngere,	*píngo,*	*pínsi,*	*pínto,*	paint
Pórgere,	*pórgo,*	*pórsi,*	*pórto,*	present
Púngere,	*púngo,*	*púnsi,*	*púnto,*	sting
Raggiúngere,	*raggiúngo,*	*raggiúnsi,*	*raggiúnto,*	overtake
Ravvólgere,	*ravvólgo,*	*ravvólsi,*	*ravvólto,*	wrap
Retropingere,	*retropingo,*	*retropinsi,*	*retropinto,*	push back
Ricingere [re	*ricíngo,*	*ricínsi,*	*ricínto,*	surround
Ricongiúnge-	*ricongiúngo,*	*ricongiúnsi,*	*ricongiúnto,*	rejoin
Ridipíngere,	*ridipíngo,*	*ridipínsi,*	*ridipínto,*	paint again
Rifrángere,	*rifrángo,*	*rifránsi,*	*rifránto,*	reflect
Ripiángere,	*ripiángo,*	*ripiánsi,*	*ripiánto,*	weep again
Ripórgere,	*ripórgo,*	*ripórsi,*	*ripórto,*	offer again
Ripúngere,	*ripúngo,*	*ripúnsi,*	*ripúnto,*	sting again
Rispe'ngere,	*rispe'ngo,*	*rispe'nsi,*	*rispe'nto,*	extinguish
Rispe'rgere,	*rispe'rgo,*	*rispe'rsi,*	*rispe'rso,*	sprinkle
Rispíngere,	*rispíngo,*	*rispínsi,*	*rispínto,*	repulse
Ristríngere,	*ristríngo,*	*ristrínsi,*	*ristre'tto,*	restrain
Ritíngere,	*ritíngo,*	*ritínsi,*	*ritínto,*	dye again
Rivólgere,	*rivólgo,*	*rivólsi,*	*rivólto,*	turn back
Riúngere,	*riúngo,*	*riúnsi,*	*riúnto,*	anoint again
Scíngere,	*scíngo,*	*scínsi,*	*scínto,*	gird
Sconvólgere,	*sconvólgo,*	*sconvólsi,*	*sconvólto,*	overturn
Scórgere,	*scórgo,*	*scórsi,*	*scórto,*	perceive
Smúngere,	*smúngo,*	*smúnsi,*	*smúnto,*	dry up
Somme'rgere,	*somme'rgo,*	*somme'rsi,*	*somme'rso,*	submerge
Sórgere,	*sórgo,*	*sórsi,*	*sórto,*	spring out
Spargere,	*spárgo,*	*spársi,*	*spárso* or *-rto,*	spread
Spíngere,	*spíngo,*	*spínsi,*	*spínto,*	thrust
Spórgere,	*spórgo,*	*spórsi,*	*spórto,*	stretch out
Úngere,	*úngo,*	*únsi,*	*únto,*	anoint

Vocabulary.

Ubriacóne, a drunkard
travagliáre, to trouble, afflict
da, of, from, with
grande, gran great
dolóre, pain
patire, to suffer
occhio, an eye
mandare, to order, send
chiamare, to call, ask for
médico, a doctor, medical man
trovare, to find
infiammare, to inflame
caro, dear
signóre, sir
vino, wine
pérdere, to lose
affatto, altogether, entirely
così, thus, so
serbare, to keep
rimédio, a remedy
per, for, to
dottóre, a doctor
più tosto, rather
che, than
finestra, a window
tutto,—e, all, the whole
casa, a house
portare, to carry
soma, a load
legna, wood
véndere, to sell
benchè, although
gridáre, to cry
spesso, often
guardare, to take care
scostare, to draw back, get out of the way
urlare, to hurt
stracciáre, to tear
mantéllo, a cloak
poi, then
pagáre, to pay
condúrre, to conduct, take
innanzi, before
podestà, a magistrate
udíre, to hear
caso, a case
querelánte, a prosecutor
ciò, that, this
vero, true
mai, ever, at all
onde, whence, after which
giúdice, a judge
voltare, to turn
muto, dumb
poco fà, a little while ago
voce, voice.

Italian-English.

Un ubriacóne travagliáto da grandissimi dolóri, che pativa in un' ócchio, mandò e chiamár il médico, il quale venúto che fù, avendo trováto l' occhio molto infiammáto, gli disse: "Caro signóre, bisógna astenérvi dal vino se non voléte pérder affátto l' occhio." "Se così è," rispose l' eltro, "potéte serbár i vostri rimédj per voi, signór dottóre; io vóglio più toeto pérdere una finéstra che tutta la casa."

Un contadino portándo una soma di legna per véndere, benchè gridásse spesso, "Guarda! guarda!" un goffo non voléndosi scostáre, fù urtáto dal contadino, e gli fù stracciáto il mentello. Voléndo poi che 'l contadíno gli pagásse, lo condússe d' inanzi al podestà, il quale, udíto il caso del querelante, domandò al contadino, se ciò era vero; il quale non rispóse mai. Onde il giúdice voltátosi a quel del mantello, "Che vuói tu," gli diese, "eh' io faccia ad un muto?" "Che muto? Non è muto, perchè poco fà gridáva a tutta voce, 'Guarda! guarda!'" "S' egli gridáve, dovévi guardáre, e così non t' avrébbe stracciáto il mantello."

English-Italian.

I was asked why I had entered the city. He married her, thinking that in time she would make (say, become) an excellent wife. A king, wishing to enter a city, asked certain deputies who were sent to him by the senate, whether a banquet was prepared for him in the palace, because he had not yet eaten (anything) that day. Wishing to joke with a tailor, I asked him why he cabbaged (say, stole) the cloth of those who gave (it) him to make clothes. How many fools are there of you in this street? Seeing night come on, I asked a barber whom I met in the road, whether I could still go in at the gate of the city. He must have had most excellent ability in his youth. There are about a dozen of us, without reckoning the painter. The bishop answered the king that he was still hungry. A countryman complaining of a scarcity of corn, said many would die of hunger in that city. The painter has caught the likeness well. He resembles him in body and in mind. In time you will become old and die. I asked him why he had not eaten (anything) at three o'clock in the afternoon. It was not necessary for him to tell them that he was still hungry. You boasted of having joked with a king. Children in their tender years have much vivacity. The senate wished to make war upon the young prince, who was not at a (say, the) mature age. A waggon of hay could go in at the gate of the city. In his (say, the) mature age he became stupid. I admire the vivacity and quickness of your genius.

Le mérite console de tout.—*Montesquieu.*

En vérité, mentir est un maudit vice. Nous ne sommes hommes, et nous ne tenons les uns aux autres que, par la parole: si nous connaissions l'horreur et le poids du mensonge, nous le poursuivrions à feu plus justement que d'autres crimes.—*Montaigne.*

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LESSONS IN SPANISH.—No. VII.

DEMONSTRATIVE PRONOUNS.

The demonstrative pronouns are *este*, this; *ese*, that; *aquel*, that. They are thus declined:—

Singular.			*Plural.*		
Masc.	Fem.		Masc.	Fem.	
Este,	*esta*,	this.	*Estos*,	*estas*,	these.
Ese,	*esa*,	that.	*Esos*,	*esas*,	those.
Aquel,	*aquella*,	that.	*Aquellos*,	*aquellas*,	those.

There is also, in the singular number of each of these demonstrative pronouns, a neuter form, used when we cannot ascribe a gender to it; *esto*, *eso*, *aquello*. In such a sentence as, "he ought to be honest, for *this* is the duty of every man," it is evident that no gender can properly be applied to the demonstrative *this*, and in such a case *esto* would be used in Spanish.

Este is used with what is near at hand; as, *este hombre*, this man (here): *ese* with what is somewhat distant; as, *ese hombre*, that man (there): and *aquel* with what is still more distant; as, *aquel hombre*, that man (off there, yonder). When relating to time, *este* is used with time present; *ese* with time past; and *aquel* with time still more distant; as, "this (*este*) book which I now have, that (*ese*) book which I had last week, and that (*aquel*) book which I had last summer, are valuable."

Este refers to the last mentioned of two things, and *ese* (or *aquel*) to the first; as,

El general y el capitan vinieron; ese (or *aquel*) *es prudente, este es fatuo*, the general and the captain came; the-former is prudent, the-latter is stupid.

When *este* or *ese* comes before the indefinite pronoun *otro* (other), the former drops its final letter, and the two are joined, forming one word; as, *estotro* or *estotra*, this other; *estotros* or *estotras*, these others; *esotro* or *esotra*, that other; *esotros* or *esotras*, those others.

If the objective case of the relative pronoun *quien* (whom) is used in such phrases as, he whom, she whom, him whom, etc., *aquel*, must come before it; *aquel á quien*,* he whom; *aquella á quien*, she whom; *aquellos* or *aquellas á quienes*, they whom; as,

Aquellos contra quienes pelearon, those against whom they fought.

When the relative pronoun of the objective case is not preceded by a preposition, the indefinite article is generally used instead of *aquel*, and is followed by the relative pronoun *que*; as, *el que*, he whom; *la que*, she whom; *los* or *las que*, they whom. Thus it will be perceived that he whom may be rendered either *aquel á quien* or *el que*; she whom, by either *aquella á quien* or *la que*; they whom, or those whom, by either *aquellos* or *aquellas á quienes*, or *los* or *las que*. The latter mode is most generally employed.

When the objective case of the personal pronoune Him, her, or them, precedes the nominative of the relative Who, either *aquel* or the definite article may be used; as,

Juan dió pan á aquella que tiene hambre, or *Juan dió pan á la que tiene hambre*, John gave bread to her who is hungry.

When in English the demonstrative pronoun That is followed by the preposition Of, and refers to a noun already expressed, the definite article is employed in Spanish; as,

Por su prudéncia y por la del juez, through his prudence and through that of-the judge.

The English demonstrative pronoun That is rendered in Spanish by the definite article when it refers to something having preceded it and is followed by the preposition Of; as, My house and that of my servant, *mi casa y la de mi criado*; his only desire was that of freeing his country from the Saracen yoke, *su único deséo era el de libertar á su patria del yugo sarraceno*; the repose of the poor-man is not a cheerless leisure like that of the rich-man, *el descanso del pobre no es un ócio insípido como el del rico*; Saguntum endured a siege equal to-that of Numantia, *Sagunto sufrió un sitio igual al de Numancia*; the soldiers of General Brown are as brave as those of General Canrobert, *los soldados del general Brown son tan valientes como los del general Canrobert*.

When in cases like those referred to in the preceding rule, the possessive case in English is employed instead of the demonstrative pronoun That, the definite article is used in Spanish; as, My house and my servant's, *mi casa y la de mi criado*; I have my book and my father's, *tengo mi libro y el de mi padre*; my wine is better than John's, *mi vino es mejor que el de Juan*; that is,—my house and that of my servant; my book and that of my father; my wine is better than that of John.

VOCABULARY.

Pronunciacion, pronunciation.	*Librero*, bookseller.
Lámpara, lamp.	*Posadero*, innkeeper.
Cuchillo, knife.	*Lóndres*, London.
Brisa, breeze.	*Fácil*, easy.
Diego, James.	*Pero*, but.
Caballero, gentleman.	*Zapatero*, shoemaker.
Espejo, looking-glass.	*Zapato*, shoe.
Tenedor, fork.	*Cerveza*, beer.
Pluma, pen, feather.	*Vino*, wine.
Lucía, Lucy.	*Ancho*, wide.
Panadero, baker.	*O*, or.
Sombrerero, hatter.	

MODEL SENTENCES.

Aquellas mugeres tienen prudéncia, those women have prudence.	*Juan habló á aquella á quien vm. vió*; or, *Juan habló á la que vm. vió*, John spoke to her whom you saw.
Aquellos á quienes mi padre habló, no tienen dinero, those (or they) to whom my father spoke, have not money.	*La pronunciacion del*† *Español es mucho mas fácil que la del Inglés*, the pronunciation of the Spanish is much easier than that of the English.
Pedro dió una lámpara á aquella que halló su sombrero, Peter gave a lamp to her who found his hat.	*¿Tiene vm. mi espejo ó el de María?* have you my looking-glass or Mary's?

SPANISH-ENGLISH.

Este hombre es rico. Aquella muger es sobérbia. Esos libros son nuevos. Estas cucharas son de oro. Aquellos pintores son pobres. Estas casas son nuestras. Ese sombrero son mios. Este vino es bueno. Ese cerveza no es buena. ¿De quiénes son aquellas casas? ¿De quién es esta casa? ¿Quién es ese caballero? ¿Habla este caballero la léngua[2] española[1]? ¿Habla ese señore la léngua[2] inglesa[1]? Esta lámpara es nueva. Ese espejo es viejo. Aquel hombre habla Frances. ¿Son estos mis zapatos? ¿Cuyo es este cuchillo? ¿Cuyos son esos tenedores? La Francesa y la Española tienen prudéncia; esa es mas amable que esta. Aquel á quien mi padre escribió las cartas, tiene mucho dinero. Aquellos á quienes Pedro dió los libros, son pobres é ignorantes. Aquella á quien Juan dió un espejo, es muy hermosa.

Diego dió los libros á los que vm. vió. Lucía dió vino á aquella que tiene sed. El librero dió dos libros á le que le escribió las cartas. Esta casa y la que vmd. vió, son mias. ¿No es este el hijo del panadero? ¿No es esta la hija del zapatero? ¿No son estas las hermanas del posadero? El sombrerero escribió estas cartas. Esos tenedores son suyos de ellos. Estos cuchillos son suyos de él. Este espejo es mio. Este hombre es mi amigo. ¿Quién es esa muger? ¿Quién

* It may be proper to mention again, that *quien* (whom) is never employed in the objective case, even if governed by a verb, without being preceded by a preposition.

† The masculine article is here used before *Español* and *Inglés* because these agree with *idioma* (idiom, or language) understood. *Idioma* is masculine.

es este caballero? ¿Es este el libro de su hermana de vm.? No, señor, este es el libro de mi padre. Esta brisa es agradable. ¿No es este brise agradable? ¿Cuya es esta pluma?

Diego halló mi sombrero y el del médico. Las cucharas de Lucía y las de María son de oro. La pronunciacion del Aleman no es tan fácil como la del Español. Juan no tiene mi libro, pero él tiene el de mi hermana. Las calles de Lóndres son mas anchas que las de Madrid. La ciudad de Madrid no es tan grande como la de Lóndres. Mi cerveza no es tan buena como la de Diego. Mi casa es alta, pero la de mi hermano es mas alta. ¿Tiene vm. mis plumas ó las de mi padre? ¿Tiene el sombrerero mi sombrero ó el de mi amigo? El sombrerero no tiene su sombrero de vm., pero tiene (he-has) el de su amigo de vm. ¿Tiene el panadero mi pan ó el del posadero? ¿Tienen los libreros tus espejos ó los de tu madre? Los libreros no tienen mis espejos, pero tienen (they-have) los de mi madre. La cervesa del posadero es tan buene como le del zapetero. Los zapatos del librero son tan viejos como los del panadero. El vino de Diego es tan bueno como el de Pedro.

English-Spanish.

This gentleman is good. This woman is rich. That man is rich. That woman is proud. Those spoons are new. Those books are old. Those painters are poor. These spoons are of gold. These houses are lofty. Those hats are ours. This beer is good. That wine is not good. Whose houses are those? Whose (of whom) house is this? Who is that gentleman? Who (plur.) are those gentlemen? Does that lady (*señora*) speak the Spanish[6] language[1]? Does this gentleman speak the French[3] language[1]? This lamp is not new. That looking-glass is not old. That man speaks English. Are these my shoes? Whose hat is that? Whose knives are these? Whose fork is this? The Spanish-woman and the English-woman have prudence; the former is more amiable than the latter. He to whom my mother wrote the letters has much money. Those to whom James gave the pens are poor and ignorant. She to whom the hatter gave a looking-glass is poor and proud.

Lucy gave the spoons to those whom you saw. James gave the knives to him whom John saw. John gave wine to him who is thirsty. Mary gave bread to her who is hungry. The bookseller gave three books to her who wrote him the letters. This house and that (*la*) which you saw are mine. Is not this the brother of the hatter? Is not this the daughter of the baker? Are not these the sons of the shoemaker? Are not these the sisters of the innkeeper? Is not this the mother of the bookseller? The carpenter wrote these letters. Those knives are hers. These forks are his. This looking-glass is ours. This man is my friend. Who is this lady? Who is that woman? Who is this gentleman? Is this the book of your brother? No, sir, this is my father's book. Whose is this pen? Whose are those pens? This breeze is agreeable. Is not this breeze agreeable?

Peter found my hat and that of the physician. The spoons of Lucy and those of Mary are of gold. Mary's spoons and Lucy's are of silver. James has not my book, but he has my sister's. The streets of London are wider than those of Madrid. The pronunciation of the French is not so easy as that of the Spanish. The city of Madrid is not so large as that of London. My beer is not so good as John's. My wine is not so good as James's. My house is lofty, but my father's is more lofty. Have you (*vm*) my pens or my father's? Has the hatter my hat, or my friend's? The hatter has not your hat, but he has your friend's. Has the baker my bread, or the inn-keeper's? Have the shoemakers my shoes, or those of my brother? The shoemakers have not my shoes, but they have (*tienen*) my mother's. The inn-keeper's wine is not so good as the shoemaker's. Peter's shoes are as old as John's.

INDEFINITE PRONOUNS.

The indefinite pronouns, or, more properly, the indefinite adjective pronouns, are—*cada*, each; *uno*, one; *todo*, every one, all; *nádie*, nobody; *alguien*, somebody; *ninguno*, none; *alguno*, some; *algo*, something; *nada*, nothing; *otro*, other; *tal*, such; *ámbos*, both; *entrambos*, both.

Of these, *uno*,* *todo*, *ninguno*,* *alguno*,* *otro*, and *tal* are declined like adjectives, both in the masculine and feminine. *Cada*, *nádie*, *alguien*, *algo*, *nada*, are used only in the singular, and do not change. *Ámbos* and *entrambos* are already in the plural, but have their feminine, *ámbas* and *entrambas*.

There are also some indefinite relative pronouns, *quienquiera*, *cualquiera*, *cualesquiera*, whoever, whosoever, whichever, whichsoever.

We subjoin a list of these indefinite pronouns, simple and combined, with examples of the manner in which they are employed in Spanish.

The following are always used as nouns, that is, are never joined to a noun:—

Cada uno, every one; *cada cual*, each one.
Los cuatro animales, cada uno de ellos tenia seis alas, the four animals, each one of them had six wings.
Todos serán premiados, cada cual segun sus obras, All will-be rewarded, each one according-to his deeds.

Uno otro, each other.
Juan y Diego se aman uno á otro, John and James love each other (love themselves *one to the-other*.)

Unos otros, one another.
Orád los unos por los otros, pray for one another (the some for the others).

Nádie, nobody, no one.
A nádie ama el avaro, the miser loves nobody (to nobody loves the miser.

Alguien, somebody, any body.
¿Le a visto alguien? has any body seen him.

Uno y otro, one and the other, both.
Uno y otro son amables, both of them are amiable.

Algo, something, anything.
Yo tengo algo que comer, I have something (which) to eat.

Nada, nothing, not anything.
Nada tengo con que mantenerme, I have nothing with which to maintain myself.

Todo lo que, all that which, everything, whatever.
Esta echó todo lo que tenia, this-woman cast-in all that (or everything) she-had.

Quienquiera que, cualquiera que, whoever, whosoever, whichever.
Quienquiera que él sea, whoever he may be.
Cualquiera que se humillare, whoever may-humble himself.

The following are never used alone, but always with a noun:—

Cada, each, every.
Cada vez, each time. *Cada palabra*, every word.

Cualquier, cualesquier, whatever.
Cualquier criatura, whatever creature.
Cualesquier criaturas, whatever creatures.

The following may be used alone as nouns, or joined to nouns as adjectives:—

Todo, todos, everything, all, everybody, every.
En todo dad gracias, in everything give thanks.
Todo árbol, every tree.
Todos tienen temor, all are afraid.
Todos los hombres, all men

Alguno, any, anybody, some, somebody, some one.
Tengo libros: ¿tiene vmd. algunos? I-have books: have you any?
Alguno me ha tocado, somebody has touched me.

* The learner must remember that *uno*, *alguno*, and *ninguno*, drop the final o when they precede a masculine noun.

Algun fruto, some fruit.
Algunas cosas, some things.
Creyeron algunos de ellos, some of them believed.

Uno, one, a person.

Un dia, one day.
Una de las hermanas, one of the sisters.
No sabe uno que hacer, one (or a person) knows not what to do.

Unos, some, certain ones.

Unos hombres, some certain men.
¿ Dió libros á algunos de estos niños ? dió libros á unos. Did-he give books to any of these children? he-gave books to some.

Ninguno, nobody, not any one, none, not any, no one.

Ninguno le vió, nobody saw him.
A ninguno dió libros, he-gave books to no-one.
Ninguna persona, no person.
Ningunos de los hijos, none of the sons.

Otro, other, another; *otros*, others, other.

Una cosa es prometer y otro cumplir, one thing it-is to promise and another to perform.
Al fin las otras mugeres vinieron, at length the other women came.

Tal, such.

De los tales es el estado, of such is the state.
En tal tiempo, in such a time.

Ambos, entrambos, both.

Ambos me gustan bien, both please me well.
Ambos sexos, both sexes.
Entrambos caen en el hoyo, both fall into the pit.

Alguien and *nádie* cannot be followed by the preposition *de*, of; but *alguno* and *ninguno* must be used; as,

Alguno de los muchachos, some-one of the boys.
Ninguna de las hijas, no-one of the daughters.

Alguno is never placed after the noun, except in negative sentences, and then it has the same meaning as *ninguno* placed before the noun; thus we can say, *Yo no hallo en él ninguno causa*, or *yo no hallo en él causa alguna*, I find no fault* in him.

Algo and *nada* may admit of an adjective joined to them, or the preposition *de* may come between; thus, we may say, *Algo nuevo*, or *algo de nuevo*, something new; *nada de natural*, nothing natural.

When by Another's we mean the opposite of One's own, it is expressed in Spanish, not by *otro*, but by *ageno* (or *ajeno*): as, *lo ageno*, that which is another's, or that which is the property of another; *los bienes agenos*, another's goods or wealth.

In Spanish, two negatives serve to strengthen a negation. Thus, *este autor no vé nada de honroso en el carácter de los Españoles*, literally, this author not sees nothing of honorable in the character of the Spaniards, or, as it would be expressed in good English, "this author sees nothing honourable in the character of the Spaniards." If in a negative sentence only one negative word is used, it must always come before the verb; if two negative words are used, the advarb of negation must come before the verb, and the other negative word after it; thus we may say, *Diego nada tiene*, or, *Diego no tiene nada*, James nothing has, or, James not has nothing, the meaning in English being, "James has nothing." The former mode of expression in Spanish is generally considered more elegant.

Vocabulary.

Obra, word, deed.	*Rosa*, rose.
Mérito, merit.	*Diferente*, different
Peso, dollar.	*Doce*, twelve.
Aldeano, villager.	*Segun*, according-to.
Falta, fault, defect.	
Serán, (they) shall be, or, will be.	*Sexo*, sex.
Tendrá, (he) shall-have, or, will-have.	*Boton*, button.
Dará, (he) will-give.	*Espina*, thorn.
Aborrece, (he) hates.	*Premiado*, rewarded.
Hay, there-is; there-are.	*Diez*, ten.
Idioma, (masc.) idiom language.	*Sin*, without.
Mal, evil, ill.	*Séa*, (he) may-be.
Cosa, thing.	*Dé*, (he) may-give.
El Señor, the Lord.	*Diga*, (he) may-say.
	Brilla, (it) shines, (it) glitters
	Comer, to-eat.

Model Sentences.

El juez no dijo mal de nádie, or, *De nádie el juez dijo mal*, the judge said evil of nobody.	*¿Qué hay en ese sombrero?* what is-there in that hat?
Hay una casa en el camino, there-is a house on the road.	*¿ No hay médico en la ciudad?* is-there not a physician in the city.
Hay muchas casas en el camino, there-are many houses on the road.	*¿ Hoy en Madrid doce pintores ?* are-there in Madrid twelve painters?

For other model sentences, the learner is referred to the examples under the indefinite pronouns.

Spanish-English.

Las tres mugeres, cada una de allas tiene dos espejos. Estos hombres serán premiados, cada cual segun sus obras. Pedro tiene doce libros, cada uno en un idioma[2] diferente[1]. Todas las mugeres serán premiadas, cada cual segun sus méritos. Ella y todas sus hijas son robustísimas. María dió libros á cada uno de ellos. Uno y otro saben lo que es bueno. ¿Hay algo de nuevo? No hay nada de nuevo. Juan no quiere nada. Los libreros no quieren nada. Todo lo que brilla, no es oro. Todo lo que Diego tiene, es mio. Todo libro tiene hojas. Nádie habla mal de él. A nádie habla el librero. El posadero no habla á nádie. A ninguno dió María los cuchillos y tenedores. El zapatero no dió los zapatos á ninguno. Nada* es bueno para él. Pedro no tiene nada. El juez no me dijo nada. Ninguna de estas señoras es rica. No[3] sabe[2] uno[1] que decir. No sabe uno que comprar.

¿Tiene vmd. otro hermano? ¿Vió alguien mi sombrero? ¿Habla alguien Español? El juez tiene dos criados; y dió al uno doce pesos, y al otro diez, á cada uno segun su mérito. El librero tiene dos hijas; el nombre de la una es María, y el nombre de la otra es Lucía. Diego halló algo en el camino. Las mugeres tienen algo que comer. Todo lo que brilla, no es plata. Pedro dió algo á los pobres. La Francesa tiene algo que comer. Una de las señoras vino conmigo. Mi hermano tiene todo lo que mi padre le dió. El que es rico, quienquiera que él séa, tendrá cuidados. A cualquiera que vmd. dé pan, Diego dará dinero. A cualquiera que María dé libros, Lucía dará zapatos. Cualquier cosa que Juan diga, sus casas no son hermosas. Todos los que son buenos, aman la verdad. Dios aborrece todos los caminos de los impíos. El Señor aborrece todo camino malo. ¿Dió Juan libros á algunos de estos Alemanes? Sí, señor, Juan dió libros á unos. ¿Tiene alguno mi sombrero? Ninguno tiene tu sombrero. ¿Tiene alguien mi espejo? Nádie tiene tu espejo. Todo eso es muy cierto.

¿Tienen algunas de estas mugeres cucharas de plata? Cada uno de nosotros tiene algun mérito. Pedro dió dinero á una de las hermanas de María. La criada no halló tesoros algunos en la ciudad. Unos hombres tienen dinero, otros no lo tienen. Muchos aldeanos de ambos sexos vinieron a la ciudad. El pintor dió un sombrero al Aleman, y un libro al Español; ambos son pobres. María no habla de las faltas agenas.

[Instead of *ninguno*, the adverb *no* is often used in the sense of Not a, not any, no, especially with verbs denoting possession; as, *ella no tiene marido*,† she has not a husband, or, she has no husband; *estas señoras no tienen libros*, these ladies have no books, or, not any books].

* Or rather, "cause of accusation" in him. In Spanish two negatives strengthen the negation.

* *Nada* requires the adjective which agrees with it to be in the masculine.

† Literally, "she has not husband."

Mi madre no tiene cuchara. Mi padre no tiene hermano. Ella no tiene tenedor. Mis hermanas no tienen cuchillos. María no tiene padre. Mis hijos no tienen sombreros. Mi hermano no tiene casa. El librero no tiene espejo. Diego no tiene dinero. Juan no tiene oro. Ella no tiene hijas. Pedro no es Americano. María no es Francesa. ¿No tiene Juan libros? Los pintores no tienen botones. Mi sobrino no tiene plumas. Este caballero no tiene mantecas. El pandero tiene pan, mantecs, azúcar, vino, y cervezs. ¿Hay cartas para mi? No, señor, no hay cartas para vmd. ¿Qué hay en el camino? Hay casas y ciudades. ¿Qué hay en esa cuchara? Hay águe en este cuchara. ¿Hay rosas sin espinas? No, señora, no hay rosas sin espinas. ¿Hay hombres sin faltas? No, señor, no hay hombres sin faltas. ¿Hay un rose sin espinas? No hay un rosa sin espinas. No hay nada. No hay casas en el camino. ¿No hay sapatero en esta ciudad? Si, señor, hay uno. ¿Hay en esa case muchos cuartos? Hay diez cuartos.

ENGLISH-SPANISH.

Every one of the ten male servants has three roses. Every one of the three women has twelve looking-glasses. These carpenters shall be rewarded (plur., *premiados*), each according-to his works. Lucy has ten books, each one in a different[2] language[1]. All the female-servants shall-be rewarded (plur. fem.), each according-to her merits. She and all her daughters are very handsome. Mary gave knives to each one of them. Both are amiable. Is-there anything new? There-is nothing new. Peter wants nothing. The gentlemen want nothing. Everything which[a] glitters is not gold. Every thing which my brother has is mine. Every book has leaves. Nobody speaks evil of him. To nobody speaks the bookseller. The innkeeper speaks to nobody. To no-one gave John the pens and spoons. The bookseller gave the books to no-one. Peter has nothing. The French-woman said nothing to me. Nothing is good for her. No-one of these ladies is rich. One[3] knows[3] not[1] what to-say. One[3] knows[3] not[1] what to-buy.

No-one of those painters shall-be rewarded. Have you (*vmd.*) another sister? Did any-one[3] see[1] my hat? Does any-one[3] speak[1] Spanish? The gentleman has two male-servants; and (he) gave to-the one tea dollars and to-the other twelve; to each one according-to his merit. The shoemaker has two daughters; the name of the one is Lucy, and the name of the other is Mary. The baker found something in the road. The booksellers have something (which) to-eat. Everything that shines is not silver. Peter said something to the poor-men. She has something (*algo que*) to eat. One of the ladies came with-me. My sister has everything that my father gave her. He who is rich, whoever (that) he may-be, will have cares. To whomsoever (that) you (*vmd.*) may-give bread, my father will-give money. To whomsoever (that) Mary may-give knives, Lucy will-give forks. Whatever thing (that) John may-say, hishouses are not handsome. All those who are good love the truth. The Lord hates all the ways (*caminos*) of the impious. God hates every wicked[2] way. All this is very true. Nobody has thy looking-glass. No-one has thy hat. Has anybody my books? Has any-one my pens? Did Peter give shoes to any of these poor women? † Yes, sir, Peter gave shoes to some. Each painter found a treasure.

Have any of those women silver forks. Have any of these ladies gold spoons? Each one of us has some merit. The shoemaker gave money to one of the sisters of Lucy. Mary wrote letters to no-one. The physician did not find any treasures in the city. Some men have money, others have it not. Many villagers of both sexes came to London. The judge gave a hat to the Frenchman and a book to the Englishman; both are poor. She speaks not of another's faults.

She has no daughters. Peter is no Spaniard. My father has no brother. John has no money. Mary has no father. You (*vmd.*) have no looking-glass. John has not-any books. These ladies have not-any roses. My nephew has not-any pens. My mother has not-a spoon. My sister has not-a fork. The housekeeper has no butter. Are-there‡ (any) letters for me? No, sir, there-are no letters for you (*vmd.*) What is-there on the road? There-are houses and cities. What is-there in that spoon? There-is sugar in it. Are-there roses without thorns? There-are no roses without thorns. Are-there women without faults? No, sir, there-are no women without faults. There-is nothing. There-are no houses on the road. Is-there no physician in that city? Yes, sir, there-is one. There-are no books without leaves.

* Everything that, or, everything which, is rendered *todo lo que*.

† Those poor women, is to be rendered *esas pobres*. These poor men, would be *esos pobres*.

‡ There is, and There are, are each rendered by *hay*. Is-there? and Are-there? are each rendered *¿hay?*

LESSONS IN ALGEBRA.—No. XXVI.

(*Continued from page* 122)

PROBLEMS IN ADFECTED QUADRATIC EQUATIONS.

Prob. 1. To find two numbers whose difference shall be 12, and the sum of their squares 1,424.

Prob. 2. Two persons draw prizes in a lottery, the difference of which is £120, and the greater is to the less, as the less to 10. What are the prizes?

Prob. 3. What two numbers are those whose sum is 6, and the sum of their cubes 72?

Prob. 4. Divide the number 56 into two such parts, that their product shall be 640.

Prob. 5. A gentlemen bought a number of pieces of cloth for 675 crowns, which he sold again at 48 crowns per piece, and gained by the bargain as much as one piece cost him. What was the number of pieces?

Prob. 6. A and B started together for a place 150 miles distant. A's hourly progress was 3 miles more than B's, and he arrived at his journey's end 8 hours and 20 minutes before B. What was the hourly progress of each?

Prob. 7. The difference of two numbers is 6: and if 47 be added to twice the square of the less, it will be equal to the square of the greater. What are the numbers?

Prob. 8. A and B distributed £1,200 each, among a certain number of persons. A relieved 40 persons more than B, and B gave to each individual £5 more than A. How many were relieved by A and B?

Prob. 9. Find two numbers whose sum is 10, and the sum of their squares 58.

Prob. 10. Several gentlemen made a purchase together for £176. Two of them having withdrawn, the bill was paid by the others, each furnishing £10 more than would have been his equal share if the bill had been paid by the whole company. What was the number in the company at first?

Prob. 11. A merchant bought several yards of cloth for £60, out of which he reserved 15 yards, and sold the remainder for £54, gaining two shillings a-yard. How many yards did he buy, and at what price?

Prob. 12. A and B set out from two towns, which were 247 miles distant, and travelled the direct road till they met. A went 9 miles a day; and the number of days which they travelled before meeting was greater by 3 than the number of miles which B went in a day. How many miles did each travel?

Prob. 13. A gentleman bought two pieces of cloth, the finer of which cost four shillings a-yard more than the other. The finer piece cost £18; but the coarser one, which was two yards longer than the finer, cost only £16. How many yards were there in each piece; and what was the price of a yard of each?

Prob. 14. A merchant bought 54 gallons of Madeira wine, and a certain quantity of Teneriffe. For the former he gave half as many shillings by the gallon as there were gallons of Teneriffe, and for the latter four shillings less by the gallon. He sold the mixture at ten shillings by the gallon, and lost £28 16s. by his bargain. Required the price of the Madeira, and the number of gallons of Teneriffe.

Prob. 15. If the square of a certain number be taken from 40, and the square root of this difference be increased by 10, and the sum be multiplied by 2, and the product divided by the number itself, the quotient will be 4. What is the number?

Prob. 16. A person being asked his age replied, if you add the square root of it to half of it, and subtract 12, the remainder will be nothing. What was his age?

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Prob. 17. Two casks of wine were purchased for 68 crowns, one of which contained 5 gallons more than the other, and the price by the gallon was 2 crowns less than one-third of the number of gallons in the smaller cask. Required the number of gallons in each, and the price by the gallon.

Prob. 18. A person bought a certain number of oxen for 80 guineas. If he had received 4 more oxen for the same money, he would have paid one guinea less for each. What was the number of oxen?

Prob. 19. It is required to divide 24 into two such parts that their product shall be equal to 35 times their difference.

Prob. 20. The sum of two numbers is 60, and their product is to the sum of their squares as 2 to 5. What are the numbers?

Prob. 21. Divide 146 into two such parts, that the difference of their square roots may be 6.

Prob. 22. What two numbers are those whose difference is 16 and their product 36?

Prob. 23. Find two numbers whose sum shall be $1\frac{1}{2}$ and the sum of their reciprocals $3\frac{1}{2}$.

Prob. 24. Required to find two numbers whose difference is 15, and half of their product is equal to the cube of the less number?

Prob. 25. A company incurred a bill of £8 8s. One of them absconded before it was paid, and in consequence those who remained had to pay four shillings a-piece more than their just share. How many were there in the company?

Prob. 26. A gentleman bequeathed £7 4s. to his grandchildren; but before the money was distributed two more were added to their number, and consequently the former received one shilling a-piece less than they otherwise would have done. How many grandchildren did he leave?

Prob. 27. The length added to the breadth of a rectangular room makes 42 feet, and the room contains 432 square feet. Required the length and breadth.

Prob. 28. A says to B, "the product of our years is 120; and if I were 3 years younger, and you were 2 years older, the product of our ages would still be 120." How old was each?

Prob. 29. Should the square of a certain number be taken from 89, and the square root of their difference be increased by 12, and the sum multiplied by 4, and the product divided by the number itself, the quotient will be 16. What is the number?

Prob. 30. A mason laid 105 rods of wall, and on reflection found that if he had laid 2 rods less per day, he would have been 6 days longer in accomplishing the job. How many rods did he build per day?

Prob. 31. The length of a gentleman's garden exceeded its breadth by 5 rods. It cost him 3 crowns per rod to fence it; and the whole number of crowns which the fence cost was equal to the number of square rods in the garden. What were its length and breadth?

Prob. 32. What number is that, which being added to its square root will make 156?

Prob. 33. The circumference of a grass-plot is 48 yards, and its area is equal to 35 times the difference of its length and breadth. What are its length and breadth?

Prob. 34. A gentleman purchased a building lot, and in the centre of it erected a house 54 feet long and 36 feet wide, which covered just one-half his land. This arrangement left him a flower-border of uniform width all round his house. What was the width of his border, what the length and breadth of his lot, and how much land did he buy?

Prob. 35. A general wished to arrange his army, which consisted of 20,886 men, in a solid body, so that each rank should exceed each file by 59 men. How many must he place in rank and file?

Prob. 36. A man has a painting 18 inches long, and 12 inches wide, which he orders the cabinet-maker to put into a frame of uniform width, and to have the area of the frame equal to that of the painting. Of what width will the frame be?

Prob. 37. A and B together invest £500 in business, of which each put in a certain share. A's money continued in trade 5 months, B's only two months, and each received back £450 for his capital and profit. What share of the stock did each contribute?

Prob. 38. A merchant sold a quantity of goods for £39, and gained as much per cent. as the goods cost him. How much did he pay for the goods?

Prob. 39. A farmer bought a flock of sheep for £60. After selecting 15 of the best, he sold the remainder for £54, and gained thereby two shillings a-head. How many sheep did he buy, and what was the price of each?

Prob. 40. A and B started from two cities 247 miles apart, and travelled the same road till they met. A's progress was 1 mile per day less than B's, and the number of days before they met was greater by 3 than the number of miles B went per day. How many miles did each travel?

Prob. 41. Two persons, A and B, invest £900 in business. A's money remained in trade 4 months, and he received £512 for his share of the profit and stock; B's money was in trade 7 months, and he received £469 for his share of the profit and stock. What was each partner's stock?

Prob. 42. A merchant bought a piece of cloth for 54 crowns; the number of shillings which he paid per yard was $\frac{2}{3}$ of the number of yards. Required the length of the cloth, and the price per yard.

Prob. 43. There was a cask containing 20 gallons of wine; a quantity of this was drawn off and put into another cask of equal size, and then this last was filled with water; and afterwards the first cask was filled with the mixture from the second. It appears that if $6\frac{2}{3}$ gallons are now drawn from the first and put into the second, there will be equal quantities of wine in each cask. How much wine was first drawn off?

Prob. 44. A man bought 80 lbs. of pepper and 100 lbs. of ginger for £65, at such prices that he obtained 60 lbs. more of ginger for £20 than he did of pepper for £10. What did he pay per pound for each?

Ratio and Proportion.

The design of mathematical investigations is, to arrive at the knowledge of particular quantities, by comparing them with other quantities, either *equal* to, or *greater*, or *less* than those which are the objects of inquiry. This end is most commonly attained by means of a series of *equations* and *proportions*. When we make use of equations, we determine the quantity sought, by discovering its *equality* with some other quantity or quantities already known.

We have frequent occasion, however, to compare the unknown quantity with others which are *not equal* to it, but either greater or less.

Unequal quantities may be compared with each other in two ways:—

First. We may inquire *how much* one of the quantities is greater than the other; or,

Second. We may inquire *how many times* one quantity contains the other.

The *relation* which is found to exist between the two quantities compared, is called the *ratio* of the two quantities.

Ratio *is of two kinds, arithmetical and geometrical.* It is also sometimes called *ratio by subtraction*, and *ratio by division.*

A arithmetical ratio *is the* difference *between two quantities or sets of quantities.* The quantities themselves are called the *terms* of the ratio, that is, the terms between which the ratio exists. Thus 2 is the arithmetical ratio of 5 to 3. This is sometimes expressed by placing two points between the quantities thus, $5 : 3$, which is the same as $5-3$. Indeed the term arithmetical ratio, and its notation by points, are almost needless, and are seldom used. For the one is only a substitute for the word *difference*, and the other for the sign $-$.

If both the terms of an arithmetical ratio be *multiplied* or *divided* by the same quantity, the *ratio* will, in effect, be multiplied or divided by that quantity.

Thus, if $a - b = r$

Then multiply both sides by k, (Ax. 3) $ka - kb = kr$

And dividing by k, (Ax. 4) $\frac{a}{k} - \frac{b}{k} = \frac{r}{k}$.

If the terms of one arithmetical ratio be added to, or subtracted from, the corresponding terms of another, the ratio of their sum or difference will be equal to the sum or difference of the two ratios.

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If $a - b$ } And $d - h$ } are the two ratios,

Then $(a+d)-(b+h)=(a-b)+(d-h)$. For each $=a+d-b-h$.
And $(a-d)-(b-h)=(a-b)-(d-h)$. For each $=a-d-b+h$.

Thus the arithmetical ratio of 11 .. 4 is 7,
And the arithmetical ratio of 5 .. 2 is 3.

The ratio of the *sum* of the terms 16 .. 6 is 10, which is also the sum of the ratios 7 and 3.

The ratio of the *difference* of the terms 6 .. 2 is 4, which is also the difference of the ratios 7 and 3.

GEOMETRICAL RATIO *is that relation between quantities which is expressed by the* QUOTIENT *of the one divided by the other.*

Thus the ratio of 8 to 4 is $\frac{8}{4}$ or 2. For this is the quotient of 8 divided by 4. In other words, it shows how often 4 is contained in 8.

The two quantities compared are called a *couplet*. The *first* term is the *antecedent*, and the *last*, the *consequent*.

GEOMETRICAL RATIO is expressed in *two ways*.

First. In the form of a *fraction*, making the *antecedent* the *numerator*, and the *consequent* the *denominator*; thus the ratio of a to b is $\frac{a}{b}$. And

Second. By placing a *colon* between the quantities compared; thus, $a:b$ expresses the ratio of a to b.

Of these three, the antecedent, the consequent, and the ratio, any *two* being given, the other may be found.

Let $a =$ the antecedent, $c =$ the consequent, $r =$ the ratio.

By definition $r = \frac{a}{c}$; that is, the ratio is equal to the antecedent divided by the consequent.

Multiplying by c, $a = cr$, that is, the antecedent is equal to the consequent multiplied into the ratio.

Dividing by r, $c = \frac{a}{r}$, that is, the consequent is equal to the antecedent divided by the ratio.

If two couplets have their antecedents equal, and their consequents equal, their ratios must be equal.

If in two couplets, the ratios are equal, and the antecedents equal, the consequents are equal; and if the ratios are equal and the consequents equal, the antecedents are equal.

If the two quantities compared are *equal*, the ratio is a unit, *or a ratio of equality*. The ratio of $3 \times 6 : 18$ is a unit, for the quotient of any quantity divided by itself is 1.

If the antecedent of a couplet is *greater* than the consequent, the ratio is greater than a unit. For if a dividend is greater than its divisor, the quotient is greater than a unit. Thus the ratio of 18 : 6 is 3. This is called a ratio of *greater inequality*.

On the other hand, if the antecedent is *less* than the consequent, the ratio is less than a unit, and is called a ratio of *less inequality*. Thus the ratio of 2 : 3, is less than a unit, because the dividend is less than the divisor.

INVERSE *or* RECIPROCAL RATIO *is the ratio of the reciprocals of two quantities.*

Thus the reciprocal ratio of 6 to 3, is $\frac{1}{6}$ to $\frac{1}{3}$, that is $\frac{1}{6}-\frac{1}{3}$.

The direct ratio of a to b is $\frac{a}{b}$, that is, the antecedent divided by the consequent.

The reciprocal ratio is $\frac{1}{a} : \frac{1}{b}$, or, $\frac{1}{a} \div \frac{1}{b} = \frac{1}{a} \times \frac{b}{1} = \frac{b}{a}$;

that is, the consequent b divided by the antecedent a.

Hence a reciprocal ratio is expressed by *inverting the fraction* which expresses the direct ratio; or when the notation is by points, by *inverting the order of the terms*.

Thus a is to b inversely, as b to a.

HINTS ON PAINTING.

PAINTING IN WAX, OR ENCAUSTIC.

THIS has recently occupied a considerable amount of interest and practical experiment in Europe. Although the process is so called, as at present practised, it differs very essentially from the methods employed by the artists of antiquity, with whom it was a very important branch of art, and extensively applied to decorative and other purposes. There seems to be much difficulty in arriving at a decided opinion with regard to the process of encaustic among the ancients, and it is very probable that their methods of employing wax as a medium of colour—or as a preservative varnish or saturation applied to fresco or tempera—were various, according to the nature of the material upon which the painting was executed, as well as to its subject and situation. Much investigation and study have been bestowed upon the subject (especially in France and Germany), as well as practical experiment by artists of skill and reputation.

In the method most generally adopted at present, the employment of heat, or the *cauterium*, is discarded. The colours are ground in a wax varnish, or medium, which is used throughout the picture, even to the preparation of walls, grounds, and canvas, precisely in the same manner as in oil-painting.

Of the preservative qualities of wax there can be no question; that a medium for colours formed upon its basis may possess in many respects obvious advantages over oils, may be equally true; and we have the assurance of artists of distinction, who have become practically familiar with the process, that it involves no difficulties which cannot be readily comprehended and overcome by any one experienced in oil-painting.

It further offers the advantage over fresco, that works of any dimension may be executed in the studio, and afterwards attached as firmly to walls as if they were painted thereon. All facilities and expedients that are available in oil-painting are equally so in this method; and there is certainly much less liability to alteration in the tints from natural causes, which more or less affect works in oil by the action of time, or from dampness and exposure.

PAINTING OR DRAWING IN PASTEL, OR COLOURED CRAYONS,

may not only be employed advantageously for sketches and studies, but also in the production of very pleasing and effective pictures. The process is very simple, and command of it may be very readily attained by any one possessing a just comprehension of the general principles of painting, and their practical application by other methods.

The paper for pastel should be stretched, in the manner advised for water-colours, and of a substantial character, not too highly sized. If slightly rubbed over with fine pumice-powder, the crayons will both work and adhere better; or a slight coat of thin starch, with pumice-powder, may be given with a broad, soft brush, as a preparation. Fine canvas thus prepared may also be used.

Crayon drawings have the disadvantage of liability to injury, unless defended by glass, or some process by which the pigments may be more firmly attached to the paper than it is possible to effect by the mere friction employed in their application. Whatever process may be resorted to, we know of none that does not in some degree at least, materially affect the clearness and purity of the tints, although even this in some cases may be turned to advantage by judicious treatment; as a crayon-drawing, thus fixed, may be worked over with tempera or water-colours, or even with oil, by the further application of varnish.*

* The following may be considered among the most approved methods of fixing drawings or paintings in crayon:—To a saturated solution of alum, in pure water, add as much fish-glue as may form a size of proper consistency (which can only be regulated by the character of the drawing for which it is intended). Let the solution stand for about thirty-six hours, after which it should be boiled. Pass this glue-water, saturated with alum, through a linen cloth, and add about an equal quantity of some colourless spirit, or diluted alcohol. For a small drawing, an ordinary dish may answer; but, if large, a wooden or other tray, water-tight, must be provided for the solution; and, holding the drawing horizontally, face downward, gently immerse it therein, cautiously guarding against its touching the bottom. Almost instantly lift it out, without changing its horizontal position, in which it must remain until dry, when the success of the process may be readily ascertained.

A drawing thus treated may be varnished by the further application of fish-glue, to which is added about one-third of spirits of wine. When this is dry, the ordinary spirit-varnish may be passed over.

Another method is, to pounce over the drawing very evenly, by means of a gauze-sieve, finely-powdered gum-arabic, after which it is exposed to the steam of boiling water.

Volatile oils are very efficient for securing crayon-drawings.

As we have known so many drawings to be utterly ruined by experimental attempts at fixing them, we advise no one to make his first trial on one of value. Glass is their surest preservative.

To mount a drawing on glass—procure a pane, or plate, of the proper size; clean it perfectly with a little whiting or chalk, and run a narrow border around it of strong glue. Very slightly damp the back of the drawing, and lay it face downwards on the glass; and be certain of a perfect adhesion of the paper on the edges, which it may be better to extend over them sufficiently to form a border. Place the drawing, thus mounted, on a cloth, or several sheets of paper laid upon a flat board, or table, and over it another dry cloth, with a drawing-board, or with one or more large books not too heavy, and let it remain until perfectly dry.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXIII.

(*Continued from page* 147.)

PHYSIOLOGICAL, PHYSICAL, MAGNETIC AND CHEMICAL EFFECTS OF THE GALVANIC PILE OR BATTERY.

Various Effects of the Galvanic Pile or Battery.—The effects of dynamical electricity are divided into the physiological, physical, magnetic and chemical. These effects differ from those of statical electricity, which are owing to an instantaneous recombination of two electricities whose tension is powerful, inasmuch as they result from the slow recombination of two similar fluids of much feebler tension, through the medium of a conducting circuit established between the two poles of the pile. In consequence of the continuity of the force which produces them, the effects of currents are much more remarkable than those of electrical machines.

The physical effects, which are divided into calorific and luminous, depend chiefly upon the quantity of electricity set in motion in the pile, and consequently upon the surface of the couples. The chemical effects, on the contrary, as well as the physiological, depend upon the tension, and consequently upon the number of the couples. All these effects increase with the power of the conducting liquid in the pile.

Physiological Effects.—Under this class are included all the effects produced by the pile upon animals, whether living or dead. We have seen that these effects were among the first observed, and that it was to them that the discovery of dynamical electricity by Galvani was owing. They consist of muscular contractions, which become very violent when the pile is powerful.

On taking hold of the electrodes of a strong pile, you feel a violent shock, resembling that produced by the Leyden jar, more especially if the hands are moistened with acidulated or salt water, which increases the conductibility. The shock is more violent in proportion to the number of the couples. With a Bunsen pile of fifty or sixty couples, on a large scale, the shock is very powerful; and with 150 to 200 couples it is intolerable and even dangerous. It is felt less speedily in the arms than the Leyden jar, and, when transmitted along a chain of several persons, is not generally felt by any but those who are nearest the poles.

As in the case of the Leyden jar, the shock is owing to the recombination of contrary electricities, but with this difference, that the discharge of the Leyden jar being instantaneous, the shock produced by it is so also, while the pile being charged again directly after each discharge, the shocks follow one another rapidly. The effect of the voltaic current upon animals varies with its direction. In fact, the researches of M. Lehot and M. Marianini show, that when the current is transmitted in the direction of the ramifications of the nerves, it produces a muscular contraction at the moment of its commencement, and a sensation at its conclusion; while if it is transmitted in the contrary direction, it produces a sensation as long as it continues, and a contraction at the moment of its cessation.

That electricity may really be substituted for vital energy, in the production of various physiological effects, was fully established, in 1816, by the interesting experiments of Dr. Wilson Philip.

"The eighth pair of nerves, distributed to the stomach and subservient to digestion, were divided by incisions in the necks of several living rabbits. After the operation, the parsley which they ate remained without alteration in their stomachs, and the animals, after evincing much difficulty in breathing, seemed to die of suffocation. But when, in other rabbits similarly treated, the galvanic power was transmitted along the nerve, below its section, to a disc of silver placed closely in contact with the skin of the animal, opposite to its stomach, no difficulty of breathing occurred. The voltaic action being kept up for twenty-six hours, the rabbits were then killed, and the parsley was found in as perfectly digested a state as that in healthy rabbits fed at the same time; and their stomachs evolved the smell peculiar to that of a rabbit during digestion. These experiments were several times repeated with similar results."

Dr. Philip obtained like results with dogs; and as he was led by analogy to apply the galvanic current successfully, from the nape of the neck to the pit of the stomach, for the relief of asthma, he also proved, by numerous experiments, that voltaic electricity is capable of carrying on the functions of respiration and digestion; from which he concluded, that "galvanism seems capable of performing all the functions of the nervous influence in the animal economy, but, obviously, it cannot excite the functions of animal life, unless when acting on parts endowed with the living principle."

The experiments of Dr. Philip were repeated, with confirmatory results, by Dr. Clarke, Ahel, and by several French physiologists. When large animals and powerful piles or batteries are substituted for the frogs and pieces of metal employed by Galvani in his first experiments, effects are produced which are very striking. Thus, if the wires of a battery of 100 plates be inserted into the ears of an ox that has just been slaughtered, the muscles of the head, if it be removed from the neck, are thrown into violent action, the eyes roll in their sockets, the jaws open and shut, the nostrils dilate, and the whole head seems to express the endurance of the most cruel torture. If the body of a horse be subjected to similar treatment, the limbs move convulsively with such force as to require the strength of several men to restrain them.

Among such experiments, those performed by Dr. Ure upon the body of an executed murderer are worthy of notice. With a pile of 270 couples of four-inch plates, the current, when passed from the neck to the heel, caused the leg, which was previously bent, to extend so powerfully, as nearly to knock down an assistant. One wire being connected with the phrenic nerve, and the other inserted in the region of the diaphragm, under the cartilage of the seventh rib, contact was rapidly made and broken, by running the end of the conducting wire along the top of the plates in the last trough. "Full, nay, laborious breathing instantly commenced; the chest heaved and fell; the belly was protruded and again collapsed with the relaxing and retiring diaphragm."

This action took place without interruption, as long as the electric discharges were continued. One conductor being applied at the eyebrow to the supra-orbital nerve, and the other to the heel, "most extraordinary grimaces were exhibited every time the electric discharges were made; every muscle in his countenance was simultaneously thrown into fearful action; rage, horror, despair, anguish and ghastly smiles united their expression in the murderer's face. At this period several of the spectators were forced to leave the apartment from terror or sickness, and one gentleman fainted."

Dr. Ure concludes his account of the above experiments with the following valuable remarks:—"It is known that cases of deathlike lethargy, or suspended animation, from disease and accidents, have occurred, when life has returned after longer interruption of its functions than in the preceding experiments. It is probable, when apparent death supervenes from suffocation with noxious gases, etc., and when there is no organic lesion, that a judiciously directed galvanic experiment will, if anything will, restore the activity of the vital functions. The plans of administering voltaic electricity hitherto pursued in such cases are, in my humble apprehension, very defective. No advantage, we perceive, is likely to accrue from passing electric discharges across the chest, directly through the heart and lungs. On the principles so well developed by Dr. Philip, and now illustrated on Clydesdale's body, we should transmit along the channel of the nerves that substitute for nervous influence which may perchance awaken its dormant faculties. Then, indeed, fair hopes may be formed of deriving extensive benefit from galvanism, and of raising this wonderful agent to its expected rank among the ministers of health and life to man."

He also observes:—"It is a matter of primary importance that, for the purpose of resuscitating dormant irritability of nerves, or contractibility of their subordinate muscles, the positive pole must be applied to the former and the negative to the latter." This conclusion he bases upon the experiment with frogs' legs, showing that the convulsive motions caused by bringing a zinc rod into contact with the crural nerves, and one of silver with the muscles, are much greater than those produced when the order of the metals is reversed.

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M. Matteucci, of Tuscany, has recently made a number of most interesting electro-physiological researches; from which it appears, that the conversion of arterial into venous blood, which Liebig has shown to be a species of combustion, and the true source of animal heat, is attended also with the formation of electrical currents. By inserting one end of a conducting wire into an incision across the fibres of a muscle in a living or recently killed animal, and connecting the other end with the external tendinous expansion, these currents may be shown, by very delicate galvanometers,* to circulate from within outwards. Hence living muscular fibres, arterial blood and cellular tissue constitute a galvanic circle, in which the two former, like the zinc and the acid of ordinary arrangements, play the part of electro-motive elements by their chemical reaction, while the latter performs the office of the copper or conducting plate. Such currents exist in all the tissues, as a necessary consequence of nutrition, but are most sensible in the muscles. Their intensity is in direct proportion to respiration. They do not circulate in living animals in the nerves, or in the muscles as masses at times of voluntary exertion; and are rendered evident most readily by judicious connexion between unequally distributed tendinous expansions and muscular fibres. When life ceases, they continue only for a short time, but longer in cold-blooded than in warm-blooded animals. By successively connecting the tendinous expansion of one muscle with the fibres of another, a compound muscular pile or battery may be formed, which will act very distinctly upon the galvanometer; and M. Matteucci has obtained signs of electro-chemical decomposition with such piles.

M. Matteucci has also investigated the differences in the excitability of the nerves produced by voltaic currents in opposite directions. He confirms and extends the views of Dr. Ure, and deduces from his experiments the following general conclusions.

The passage of the electric current through a mixed nerve produces a variation in the excitability of the nerve, differing essentially in degree, according to the direction of the current through the nerve. This excitability is weakened and ultimately destroyed, more or less rapidly, according as the *direct current* (one through the nerve from the centre to the surface) is more or less intense. On the other hand, by the passage of the same current in the opposite direction, or the *inverse current*, the excitability is preserved and increased.

If the same current be made to act upon a mixed nerve, the contraction which occurs at the first moment of its introduction is very different, according to its direction; the direct current always producing a stronger contraction than the inverse.

When the current ceases, the variations in the excitability produced by its passage disappear more or less rapidly. If the nerve be taken from a living animal, so that its excitability is very great, they last only as long as the current circulates; while if the nerve has lost some of its excitability, they survive the cessation of the current from one to fifteen seconds.

In the treatment of cases of paralysis, lock-jaw, etc., Matteucci thinks that electrical currents may be used with success; and recommends that the operation should not be kept up long at any time; for paralysis ensues when a current passes through a nerve in one direction for a length of time, though it may be generally promptly removed by reversing the current. The more powerful the current, the shorter, therefore, should be the time of its application. For paralysis of the muscles, he recommends that the current should be directed from the extremities to the centre, and inversely for paralysis of the nerves of sensation.

Voltaic electricity should always be used for medicinal purposes, instead of mechanical, when shocks are to be given; because, by varying the distance, etc., the intensity of the shock may be modified at pleasure.

Calorific Effects.—A voltaic current which passes along a metallic wire produces the same effects as the discharge of a battery. The wire becomes heated till it is red hot, and melts, or is dissipated, according as its length and its diameter are greater or less. With a very powerful pile all metals are melted, even iridium and platinum, which resist the action of the most intense furnace. Charcoal is the only substance which it has not yet been possible to melt with the agency of the galvanic battery. M. Despretz, however, has succeeded in softening it very perceptibly, and states that he has even obtained traces of fusion with a Bunsen pile of 600 couples. Copper, gold and silver wires are quickly dissipated, giving out bright vari-coloured sparks.

By making the current pass along metallic wires of the same diameter and the same length, but of different nature, Children proved that those are most readily heated which have the least electric conductibility; whence he concluded that the calorific effects of the pile are owing to the resistance which the current meets in its passage along the conductor which connects the piles.

We have already remarked, that the calorific effects depend more upon the quantity of the electric fluid which circulates in the current than upon the tension; in other words, they depend more upon the number than upon the surface of the couples. In fact, it is possible to melt a thin iron wire with a single couple of Wollaston's pile, the zinc being eight inches by six.

By placing in the current a metallic wire, isolated in a glass tube full of water, fulfilling the office of a calorimeter or heat-measurer, M. E. Becquerel found that the disengagement of heat by the passage of the electricity through solid bodies was subject to the following laws:

1. The quantity of heat disengaged is in direct proportion to the square of the quantity of electricity which passes in a given time.

2. This quantity of heat is in direct proportion to the resistance of the wire to the passage of the electricity.

3. Whatever be the length of the wire—provided its diameter be constant, and it transmits the same quantity of electricity—the temperature is the same along the whole length of the wire.

4. For the same quantity of electricity, the temperature at different parts of the wire is in inverse proportion to the fourth power of the diameter.

The calorific effects of currents are more difficult to observe in liquids, as these bodies have greater specific heat than solids, and the gases which are produced absorb a great quantity of latent heat. For example, in the decomposition of water, it is found that the temperature is less at the negative pole, where the volume of hydrogen which is disengaged is double of that of the oxygen obtained at the positive pole, as will be seen hereafter.

Luminous Effects.—The electric pile is, next to the sun, the source of the most intense light that we know of. Its luminous effects are manifested by sparks; or the incandescence of substances which unite the two poles.

To obtain sparks, when the pile is powerful enough, bring the electrodes together, leaving a small interval between them, and bright sparks will be seen succeeding each other with sufficient rapidity to produce a continuous light. With eight or ten couples of Bunsen's pile, you may obtain brilliant luminous plumes by making one of the electrodes communicate with a rasp, and moving the other over the teeth of the rasp. If, in this experiment, you make the current pass through the bobbin of an electro-magnet—a figure and description of which will be given in a future lesson—the sparks will acquire a remarkable intensity. This effect will be explained when we come to speak of the phenomena of induction.

But it is principally in the incandescence of the conductors through which they pass that currents present remarkable luminous effects. An iron or platinum wire which connects the two poles of a powerful battery, and is large enough not to be melted, becomes incandescent, and throws out a bright light as long as the pile is in operation.

When the poles of a battery consisting of a numerous series of large plates, so as to develop an electrical current of considerable quantity and intensity, terminate in charcoal points, the most brilliant light which can be made artificially is emitted whenever these points are brought into contact. And if they be gradually drawn apart, the current will still continue to flow between them through the rarefied air, even at the distance of several inches, forming an arch of light of dazzling brightness, in which the most refractory substances are either

* These instruments will be described in a future lesson.

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fused or burnt away with rapid scintillations. This light is not produced by combustion, for the charcoal is not burnt, and the two points weigh nearly the same after as before the experiment, though there is a transfer of matter from one to the other in a vitrified state. A singular fact in relation to this arch of light, is its rapid rotation when subjected to the influence of a magnet.

When attention was first drawn to the calorific and luminous effects of electricity, it was supposed that the fusion and volatilisation of metals could only be produced by means of large and very powerful batteries or piles. Dr. Wollaston, however, established the contrary by means of a very small battery made of a lady's thimble, with which he fused a capillary platinum wire; and he thus proved, that the only condition requisite for the development of intense heat is, that the conducting wire should be of sufficient size to transmit freely the quantity of electricity generated by the battery.

The light emitted by the deflagration or burning away of metals at the poles of a battery varies in colour with the nature of the metal. Thus silver produces a beautiful green light, copper a bluish white with red sparks, and lead a beautiful purple.

Davy's Experiment.—Sir Humphry Davy was the first who made the experiment of the two points of charcoal, with a pile of 2,000 couples formed of plates measuring four inches square. This he did in London in the year 1801. The experiment was performed by means of the globe represented in fig. 410, p. 621. The fixed rod c ends in a small cone of charcoal, and the moveable end D in another similar cone capable of being brought near the first, or separated from it, as may be desired, by sliding up and down. A vacuum being produced in the globe, and the two cones of charcoal at first brought into contact, the current is passed through them. The point of contact of the two cones soon exhibits a dazzling brightness, which gradually extends to a certain distance from the points of the cones. You may now raise the upper cone from half an inch to an inch and a half without breaking the current. The two electricities recombining in the interval which separates the two cones, this space is occupied by luminous arcs of the most brilliant splendour.

In Davy's experiment it was long customary to employ charcoal obtained from light wood, by extinguishing it when red-hot in mercury. This metal, by penetrating the pores of the charcoal, increases its conductibility; but being quickly reduced to vapour by the high temperature of the charcoal, it tarnished the sides of the globe. The charcoal, also, being very porous, burned with great rapidity, on which account the experiment was performed in a vacuum. At the present day, use is made of coke obtained from the residuum in gas retorts. This coke, which is hard and compact, may be cut into sticks like those represented by P and N, fig. 430; and, as it burns slowly, there is no occasion for operating in a vacuum. When the experiment is performed in a vacuum there is no combustion, and yet the charcoal is consumed, which arises from volatilisation and a transference of matter from the positive to the negative pole, as stated above. Fig. 429 represents the image of two pieces of coke projected upon a screen in a camera obscura, at the moment when electric light is produced. In this experiment it is easy to distinguish the two burning pieces of coke, and to see that the positive one is hollowed out and diminished, while the other increases. As for the globules represented on the two pieces, they arise from the fusion of a small quantity of silica contained in the coke. When the current begins to pass, the negative piece of coke first becomes luminous, but the positive one exhibits the most intense brilliancy, and is most quickly wasted away. Hence it is better to make the latter a little larger than the other.

Fig. 429.

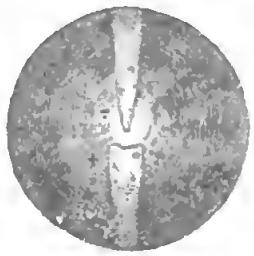


Fig. 430.

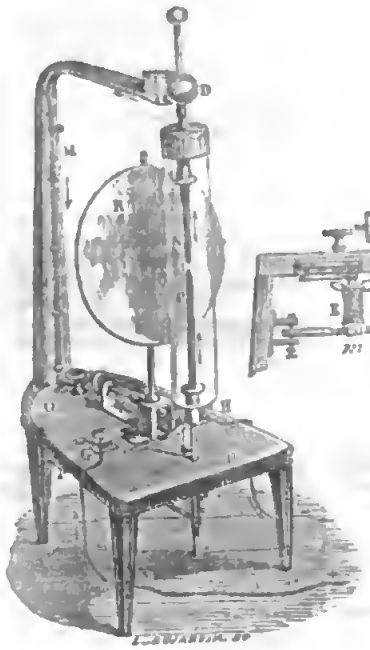
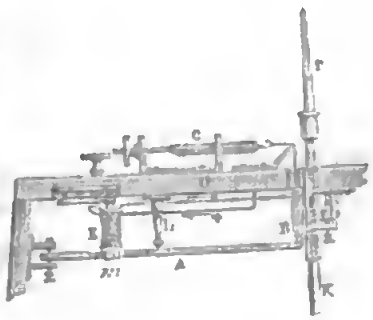


Fig. 431.



Electric-light Regulator.—When we wish to apply electric light to lighting purposes, it is necessary that it should retain the continuity of brightness which other methods of lighting possess. Now it is not sufficient for this purpose that the current of the pile be constant; it is also necessary that the interval between the pieces of charcoal should continue to be pretty nearly invariable, for which purpose they must be capable of being brought nearer as they are consumed away. Several apparatus have been devised for the attainment of this end. That which we are about to describe is the invention of M. Deleuil.

This apparatus consists of a cast-iron tripod, fig. 430, upon which are fastened the two pieces of charcoal and the regulator, which keeps them constantly at the same distance from each other. The negative charcoal N, is supported by a metallic rod which slides easily in a support D, but which, when once arranged, remains unmoved. The positive charcoal P rises at intervals from the very affect of the current, as the distance between the two tends to increase.

This result is obtained by means of a regulator fixed below the tripod, and represented sectionally in fig. 431. A lever A, attached at one end to a spring B, is capable of turning upon a pivot L, but only in a very slight degree, being supported at the other end between the ends of two screws, which are regulated so as to leave very little play for the lever. The lever A tends to turn in one direction under the action of the spring B, and in the other under the influence of an electro-magnet E. This latter, which will be described on a future occasion, consists of a soft iron cylinder wound round with a copper thread, covered with silk, along which the current passes to the charcoal. The cylinder, thus arranged, has the property of becoming a magnet of considerable power when the current passes along the wire, but which grows feeble and ceases altogether with the current. Lastly, a small piece of steel, fastened to the extremity, B, of the lever, rests at I on small teeth or notches, like those of a pothook, all along the rod K, which supports the positive charcoal P, and communicates to it the motion of the lever.

When the current passes with all its intensity along the wire of the electro-magnet, this latter attracting an iron armature *m*, which is fastened to the lever A, the arm of the lever on the right of the pivot L is lowered, and draws down with it the piece of steel I, which does not, however, lower the rod K, as the hook of the steel does not work in the teeth of the rod except during the ascent. On the contrary, if the distance between the pieces of charcoal increases, and the current consequently gets feeble, as the electro-magnet is no longer sufficient to produce equilibrium with the spring B, the arm of the lever, which was previously lowered, now rises, and raises the rod K by means of the steel I. The pieces of charcoal being brought near each other, the current acquires increased intensity, and the electro-magnet resumes its functions. The same series of motions being periodically renewed whenever the current tends to grow feeble, the intensity remains always nearly the same. The piece of iron C serves to regulate the spring B. The course of the current is sufficiently indicated by the arrows in the figure. The cylindrical glass tube which surrounds the pieces of charcoal is intended to keep them from the currents of air, which would diminish the heat. Opposite the charcoal is a metallic reflector R, which is raised at pleasure.

The above apparatus has been employed with great success in Paris. With fifty Bunsen couples of the large size it maintained such a brilliant light at the baths near the Pont Neuf, that one could see to pick up a small coin, about the size of a fourpenny-piece, from the bottom of the Seine. The light will last six hours without requiring the acids of the pile to be renewed, and the expense during that time is estimated by M. Deleuil at about fourteen or sixteen shillings, with a pile of fifty large couples.

M. Foucault, and subsequently M. Duboscq, have constructed electric-light regulators, in which both the pieces of charcoal are moveable. By this arrangement the light may be made very steady, which is necessary when we wish to employ electric light for optical experiments.

Properties and Intensity of Electric Light.—Electric light determines the combination of a mixture of chlorine and hydrogen, and acts upon chloride of silver in the same way as the light of the sun. This light also possesses the property of being attracted by a magnet, a phenomenon connected with the action of magnets upon currents which will be more fully described in a future lesson.

On being transmitted through a prism, electric light gives a spectrum like the solar spectrum. Stripes also are observable like the Fraünhofer stripes, but instead of being dark they are bright. By forming the positive pole with a metal which is transferred to the negative pole, the spectrum and the stripes are modified.

To show the intensity of electric light, we may mention that M. Bunsen, on experimenting with forty-eight couples, and separating the pieces of charcoal about a quarter of an inch, found the light equal to that of 572 wax candles. But this experiment was made with couples in which the charcoal was outside and the zinc inside, and these couples have much less effect than those in which the charcoal is inside. Consequently the light from forty-eight of these latter couples would be equivalent to far more than 572 wax candles.

Messrs. Fizeau and Foucault, who have sought for a comparison between electric and solar light, have not compared the quantities of light diffused from these two sources, but their chemical effects upon the iodide of silver on daguerreotype plates. The results they obtained give us no information as to the optical intensity of electric light.

Representing the intensity of solar light at noon by 1000, the above two philosophers found that of forty-six Bunsen couples was represented by 235, and that of eighty couples by only 238. It follows from these numbers, that the intensity of the light does not increase at a constant rate with the number of the couples, but experiment shows that it increases in a great measure according to their surface. In fact, with three series of forty-six couples, each connected together in a parallel direction, so that their positive poles terminate in one, and also their negative poles—which comes to the same thing as tripling the surfaces—the intensity was 385 after the apparatus had been in operation for an hour, that is, it was more than a third of the intensity of solar light.

M. Despretz, who has made many experiments with the pile or battery, observes that one cannot be too careful in guarding against its luminous effects when they reach any degree of intensity. The light of a hundred couples may, he says, occasion very painful injuries to the eyes. With 600 a single moment is sufficient to cause very violent pains in the head and eyes, and the face is burnt as if by a sun-stroke. Hence it is absolutely necessary to wear deep blue glasses when making these experiments.

LESSONS IN MORAL SCIENCE.—No. IX.

THE NATURE OF VIRTUE (*continued*).—DIFFERENT HYPOTHESES.

If that, and that alone, is virtue, which is approved by a mind duly enlightened, and in a sound state, then the attempt to reduce all virtuous actions to some one kind—as to benevolence, for example—is not the way to arrive at the truth. For while benevolent actions generally meet with the approbation of the moral faculty, we can easily conceive of an exercise of benevolence which, instead of being approved, would be viewed as morally indifferent, or merely amiable—as a natural affection, or even as evil. We never ascribe morality to the kind feeling of brutes to one another. The natural affection of parents, called *storge* by the Greeks, is no more of a moral nature than the same affection in inferior animals. The natural affection of our relatives, our neighbours, and countrymen, is amiable and useful, but not of a moral character. If a judge should feel a strong benevolence towards all criminals, so as to avoid inflicting on them the penalty of the wholesome laws of the country, we should judge it wicked. It might be said that a benevolence which counteracts a greater good, is not virtuous but sinful; yet it is an exercise of benevolence, and serves, on the concession of those who make all virtue to consist in benevolence, to show that all benevolence is not virtue, which is the very thing to be proved. Again, there are acts of moral agents which have nothing of the nature of benevolence, yet

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which the moral faculty judges to be morally good. For example, if a man for the sake of moral improvement denies himself some gratification which would in itself be pleasing to nature, we judge such self-denial to be virtuous.

A thousand acts of prudence which have regard to our own best interest, without interfering with the interest of others, have always been reckoned virtuous. Indeed, among the ancient sages, prudence was one of the four cardinal virtues. The attempt, therefore, to reduce all virtue to the simple exercise of benevolence, must be unsuccessful. It is so evident that some actions which have our own welfare as their object are virtuous, that rather than give up their theory that all virtue consists in benevolence, they enlarge the meaning of the word, so as to make it include a due regard to our own welfare. But this is really to acknowledge that all virtue does not consist in benevolence, according to the usual meaning of that word. Any term may be made to stand for the whole of virtue, if you choose to impose an arbitrary meaning upon it. Benevolent affections, however, is a phrase which has as fixed and definite a meaning as any in the language, and by all good writers is used for good will to others. Benevolent affections are, therefore, constantly distinguished from such as are selfish. If, however, any one chooses, contrary to universal usage, to employ the words in a sense so comprehensive as to include self-love, be it so. We will not dispute with such a one about the meaning of the word, provided he agree that the judicious pursuit of our own improvement and happiness is virtuous.

To determine how many different kinds of actions are virtuous, we must pass them in review before the moral faculty and then classify them; being in the whole process governed by the light of true knowledge, and taking into view all the relations in which the human race, or any portion of it, is placed. Something of this kind we may attempt in succeeding lessons; in which we shall endeavour to survey the moral duties incumbent on men in their various relations.

WHETHER VIRTUE AND VICE BELONG ONLY TO ACTIONS.

It has repeatedly been brought into view that moral qualities are found only in actions of moral agents, and not in all actions, but only in those performed under certain circumstances. But when we consider those actions which are of a moral nature, we find that they are complex, consisting of an external and internal part. At once we can determine that a mere external or corporeal action can possess no morality, except as connected with the internal or mental exercise which produced it, and of which it is the exponent. But here again there are several acts of the mind clearly distinguishable from one another, and it is of importance to determine in which of these the moral quality exists. On this subject there is a diversity of opinion. It seems commonly to be taken for granted, that the act of volition is, so to speak, the responsible act, and this has led to the maxim almost universally current, that "no action is of a moral nature which is not voluntary." Accordingly, writers of great eminence have entertained the opinion, that to render our desires and affections moral, they must directly or indirectly proceed from volition. But here arises a serious difficulty. Our desires and affections are not subject to our volitions. We may will with all our energy to love an object now odious, but our will produces no manner of effect, except to show us our inability to change our affections by the force of the will. On the contrary, we find by constant experience that our volitions are influenced uniformly by our prevailing desires. No man ever put forth a volition which was not the effect of some desire, feeling, or inclination. Now, after the most attentive examination of our minds, we find that certain affections which are neither produced by volitions nor terminate in volitions, are, in the judgment of all reflecting men, of a moral nature. For example, envy at the prosperity of a neighbour is not the result of any volition, and it may be cherished inwardly without leading to any volition, the will being controlled by other feelings which prevent action; yet all must admit it to be a morally evil disposition. The truth then appears to be, that our affections are properly the subject of moral qualities, good and evil. Volitions take their character entirely from the internal affections or desires from which they proceed. The volition, viewed abstractedly, is always the same, when the external action is the same; but the moral character of the acts, where the volitions are the same, may vary exceedingly. If we will to strike a man with a deadly weapon, the simple volition which precedes and is the immediate cause of the action, is the same whether we give the stroke in self-defence, in execution of the law, or through malice prepense. Indeed the volition of an insane person to strike a blow is exactly similar to the volition of a sane person striking a similar blow. Hence it is evident that the proper seat of moral qualities is not in the will, considered as distinct from the affections, but in the affections themselves, which give character to the volition as much as to the external action. These internal affections or desires are properly the springs of our actions, and our wills are the executive power by which they are carried into effect. They are commonly called motives, and very properly, as they move us to action; but we have avoided the use of that word, because it is ambiguous, and has occasioned much misconception on the subject. By motives, many understand reasons or external qualities in the objects of our desires; that which excites or moves our affections. Then when it is asserted that the will is governed by the strongest motives, some understand the meaning to be the strongest reasons, or those qualities in an object best adapted to excite our affections. In this sense the proposition is not true. Minds are often in such a state that they are not governed by that reason which in their own view is the strongest; that is, which in their better judgment seems wisest and best. And often our minds are not influenced or governed by those external objects or considerations which in the judgment of impartial reason are most weighty. But if by motives be understood the desires themselves, actually in exercise at the time, however produced, then it may be truly said that the will is always determined by the strongest motives, that is, the strongest desires. But even this proposition needs qualification. The strongest single desire does not always govern the man, but the strongest combination of desires, as may be thus exemplified. A man in returning from a journey on a cold day has a strong desire to reach home without delay; but passing a house where he knows he can enjoy a warm fire, and good refreshment, and the company of a friend, though his desire to reach home is stronger than his desire to see his friend, stronger than his desire to enjoy the fire, or his desire for food or drink, yet all these combined prove sufficient to induce him to stop.

It is often said that the intention or end for which an action is performed determines its moral character; and as our desires always point to some object which is the end of the action, this account of the matter coincides with the view already given. As if a man gives money to another, though we see the action, and are sure that it was voluntary, yet that determines nothing respecting the moral character of the action. Before we can judge any thing correctly, we must know the intention with which the act was performed. If it was to pay a just debt, we approve it as a moral act, but of small merit. If it was to supply the wants of a poor suffering family, unable to help themselves, we still approve, but our approbation is much stronger; the act is more meritorious than the former. But if we are informed that the person on whom the benefit was conferred was an enemy who had sought every opportunity to injure him who is now his benefactor, we esteem it the highest degree of Christian virtue. But if it should appear that the money was given to a common drunkard, to enable him to procure intoxicating drink; though the external act and volition are the same, instead of approving the action, we censure it as culpable. And finally, if it should appear that the intention was to hire an assassin to murder an innocent person, and that person a benefactor, our emotion rises to the highest degree, and we reprobate the action as evil in the extreme. In all these cases, the action and the volition producing it are the same. The only difference is in the end or intention with which it was done. The intention will serve to characterise actions very well, but is not comprehensive enough to take in all the exercises of mind which possess a moral character. We feel habitually a kind disposition to our fellow-creatures, but for much of our time we have not the opportunity of performing any particular acts of kindness. All impartial persons will say that this habitual feeling is of a virtuous character; but there is no intention in the case. It is merely a feeling which terminates in no volition or action.

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Our neighbour, who has been a bad man, undergoes a real change of character, and from being profane and quarrelsome, becomes pious and peaceable. We rejoice in the change. This joy is a virtuous emotion, though it has no intention accompanying it. This will serve to show that making the intention the sole characteristic of morality, is correct in regard to actions, but is not comprehensive enough to take in the whole of morality.

It may seem that, in what has been said, we contravene the maxim, that all moral actions are voluntary, a maxim which has received the sanction of ages, and may be considered an intuitive principle: whereas it is now maintained, that there are exercises of mind which do not involve any exercise of will; and that our volitions themselves have nothing of a moral nature but what they derive from the motives from which they proceed.

The maxim, rightly understood, is no doubt just, and we should never affect the wisdom of being wiser than the common sense of mankind, where we meet with truths in which all men of sober reflection have been agreed. It is safer to take them for granted, as believing that universal consent in such matters furnishes the best evidence of truth.

But the explanation is easy. The maxim applies primarily to *actions*, which must be voluntary to have the character of morality. If the action is not voluntary, it is not properly the action of the person who seems to perform it, for we can act in no other way than by the will.

But again, the word *voluntary*, as employed in the maxim under consideration, includes more than volition; it comprehends all the spontaneous exercises of the mind; that is, all its affections and emotions. Formerly all these were included under the word *will*, and we still use language that requires this latitude in the construction of the term. Thus it would be consonant to the best usage to say, that man is perfectly voluntary in loving his friend or hating his enemy; but by this is not meant, that these affections are the effect of volition, but only that they are the free spontaneous exercises of the mind. That all virtue consists in volition, is not true—as we have seen; but that all virtuous exercises are spontaneous, is undoubtedly correct. Our moral character radically consists in our feelings and desires. These being the spontaneous actings of certain latent principles or dispositions, this hidden disposition is also judged to be morally evil, because it is productive of such fruit. And of good dispositions we judge in like manner.

LESSONS IN ARITHMETIC.—No. XXXIV.

INTEREST.

Interest is the sum paid for the use of money by the borrower to the lender. It is reckoned at a given percentage per annum; that is, so many pounds are paid for the use of £100 for one year.

The student should be careful to notice the distinction between *commission* and *interest*. The former is reckoned at a certain percentage without regard to time; the latter is reckoned at a certain percentage for one year; consequently, for longer or shorter periods than one year, like proportions of the percentage for one year are taken.

The phrase *per annum* signifies for one year.

The money lent, or that for which interest is paid, is called the *principal*.

The percentage paid per annum is called the *rate*.

The sum of the principal and interest is called the *amount*. Thus, if I borrow £100 for one year, and agree to pay 5 per cent. for the use of it, at the end of the year I must pay the lender £100, the sum which I borrowed, and £5 interest, making £105. The principal, in this case, is £100, the interest £5; the rate 5 per cent., and the amount £105.

The term per annum is seldom expressed in connection with the rate per cent., but it is always understood; for the rate is the percentage paid per annum.

The rate of interest is usually established by law. It varies in different countries.

When no rate is mentioned, the rate established by the laws of the country in which the transaction takes place is always understood to be the one intended by the parties.

Any rate of interest higher than the legal rate is called *usury*, and the person exacting it is liable to a heavy penalty.

Any rate less than the legal rate may be taken, if the parties concerned so agree.

Ex. 1.—What is the interest of £30 for one year at 6 per cent.?

Analysis.—We have seen that 6 per cent. is $\frac{6}{100}$. Since, therefore, the interest of £1 for one year is £$\frac{6}{100}$, the interest for £30 for the same time must be 30 times as much, or £30 × $\frac{6}{100}$, which on reduction is found to be £1 16s.

Operation.

£
30 Prin.
6 Rate.

100) 1·80
20

16·00

£1 16s. Ans.

We first multiply the principal by the rate per cent. and then divide by 100, reducing to shillings, pence and farthings, if there be any remainder, and dividing by 100 after each reduction.

Ex. 2.—What is the interest of £140 5s. for 1 year, 1 month and 10 days, at 7 per cent.? Also, what is the amount?

Operation.

£	s.	d.		£	s.	d.	
140	5	0	Prin.	12)	9	16	4½ Int. for 1 year.
		7	Rate.	3)		10	4$\frac{1}{12}$ " 1 mo.
						5	5$\frac{5}{12}$ " 10 days.
100) 9·81	15	0			10	18	2 Total Interest.
	20				140	5	0 Principal.
	16·35						
	12			£151	3	2	Amt. required.
	4·20						

Analysis.—One month is $\frac{1}{12}$ of a year; therefore the interest for a month is $\frac{1}{12}$ of the interest for a year. Ten days are about one-third of a month, therefore the interest for ten days is about one-third of the interest for a month. To get the *exact* interest for ten days it will be necessary to make the following statement:—

365 days : 10 days : : £9 16s. 4½d.

and work according to the Rule of Three. The amount is found by adding the principal to the interest.

Ex. 3.—What is the interest of £250 16s. for 4 years, at 5 per cent. per annum? Also, what is the amount?

Solution.

£	s.	d.		£	s.	d.	
250	16	0		12	10	9½	Int. for 1 year.
		5				4	
100) 12·54	0	0		50	3	2$\frac{2}{3}$	" 4 years.
	20			250	16	0	Principal.
	10·80			£300	19	2$\frac{2}{3}$	Amt. required.
	12						
	9·60						

From the foregoing illustrations and principles we deduce the following general

RULE FOR COMPUTING INTEREST.

1. For one year. *Multiply the principal by the given rate and divide the product by* 100.

2. For two or more years. *Multiply the interest of one year by the given number of years.*

3. For months. *Take such a fractional part of one year's interest as is denoted by the given number of months.*

4. For days. *Take such a fractional part of one month's*

interest as is denoted by the given number of days; or employ the Rule of Three.

The amount is found by adding the principal and interest together.

EXAMPLES.

1. What is the interest of £423 for 1 year at 7 per cent.?
2. What is the int. of £240 6s. 6d. for 3 years at 6 per ct.?
3. What is the int. of £403 13s. for 2 years at 5 per ct.?
4. What is the int. of £640 for 1 year at 6 per ct.?
5. What is the int. of £420 10s. for 2 years at 7 per ct.?
6. What is the int. of £185 1s. 3d. for 4 years at 6 per ct.?
7. What is the int. of £864 16s. for 5 years at 4½ per ct.?
8. What is the int. of £763 for 4 months at 7 per ct.?
9. What is the int. of £940 4s. for 6 mo. at 6 per ct.?
10. What is the int. of £243 2s. for 6 mo. at 6 per ct.?
11. What is the int. of £195 16s. for 7 mo. at 6 per ct.?
12. What is the int. of £426 7s. for 9 mo. at 6 per ct.?
13. At 7 per cent. what is the int. of £738 for 1 year and months?
14. At 6 per ct. what is the int. of £894 for 1 year and 6 mo.?
15. At 7 per ct. what is the amount of £926 for 6 mo.?
16. At 7 per ct. what is the amt. of £648 for 2 mo. 15 days?
17. At 6 per ct. what is the amt. of £1,000 for 1 mo. 11 days?
18. At 5 per ct. what is the amt. of £1,566 9s. 6d. for 3 mo.?
19. At 6 per ct. what is the amt. of £872 for 4 mo.?
20. What is the int. of £681 for 10 days at 6 per ct.?
21. What is the int. of £483 4s. 6d. for 16 days at 7 per ct.?
22. What is the int. of £569 9s. for 20 days at 6 per ct.?
23. What is the amt. of £95 for 1 year and 6 mo. at 6 per ct.?
24. What is the amt. of £148 for 8 mo. 12 days at 6 per ct.?
25. What is the amt. of £700 for 30 days at 7 per ct.?
26. What is the int. of £340 for 60 days at 5½ per ct.?
27. What is the int. of £4,685 for 90 days at 6½ per ct.?
28. What is the amt. of £3,293 for 30 days at 7 per ct.?
29. What is the amt of £5,265 for 15 days at 6 per ct.?
30. What is the int. of £8,310 for 10 days at 7 per ct.?
31. What is the int. of £50,626 for 21 days at 7 per ct.?
32. What is the amt. of £65,256 for 4 mo. at 7 per ct.?
33. What is the amt. of £156 15s. for 1 year and 4 mo. at 5 per cent.?
34. What is the int. of £275 12s. 6d. for 1 year at 7 per ct.?
35. What is the int. of £89 7s. 6½d. for 2 years at 6 per ct.?
36. What is the int. of £500 for 6 mo. at 5 per ct.?
37. What is the amt. of £1,525 10s. for 8 mo. at 6 per ct.?
38. What is the amt. of £2,000 for 10 years at 4½ per ct.?

PROBLEMS IN INTEREST.

It will be observed that there are *four parts or terms* connected with each of the preceding operations, viz.: *the principal, the rate per cent., the time, and the interest, or the amount.* These parts or terms have such a relation to each other, that if any *three* of them are given, the *other* may be found. The questions, therefore, which may arise in interest are numerous; but they may be reduced to a few general principles or problems.

A number or quantity is said to be given, when its value is stated, or may be easily inferred from the conditions of the question under consideration. Thus, when the principal and interest are known, the *amount* may be said to be given, because it is merely the *sum* of the principal and interest. So, if the principal and the amount are known, the *interest* may be said to be given, because it is the *difference* between the amount and the principal.

PROBLEM I.

To find the INTEREST, *the principal, rate per cent., and the time being given.*

This problem embraces all the preceding examples pertaining to interest, and has already been illustrated.

PROBLEM II.

To find the RATE PER CENT., *the principal, the interest, and the time being given.*

Ex. 1.—A man borrowed £80 for 6 years, and paid £36 for the use of it: what was the rate per cent.?

Analysis.—The interest of £80 at 1 per cent. for 1 year is $£\frac{80}{100}$ or 16s.; consequently for 5 years it is 6 times as much, and 16s. × 5 = £4. Now since £4 is 1 per cent. on the principal for the given time, £36 must be $\frac{36}{4}$ of 1 per cent. which is equal to 9 per cent.

Or, we may reason thus: Since £4 is 1 per cent. on the principal for the given time, £36 must be as many per cent. as £4 is contained times in £36; and £36 ÷ 4 = 9.

Ans. 9 per cent.

Proof.—£80 × ·09 = £7·20, the interest of £80 for 1 year at 9 per cent., and £7·20 × 5 = £36·00, the interest for 6 years, which is equal to the sum paid. Hence,

To find the *rate per cent.* when the principal, interest and time are given.

Divide the given interest by the interest of the principal at 1 *per cent. for the given time, and the quotient will be the required per cent.*

Or, find the interest of the principal at 1 *per cent. for the given time; then make the interest thus found the denominator, and the given interest the numerator of a common fraction; reduce this fraction to a whole or mixed number, and the result will be the rate per cent. required.*

2. If I lend £500 for 2 years, and receive £50 interest, what is the rate per cent? Ans. 5 per cent.

3. A man borrowed £620 for 6 months, and paid £24 16s. for the use of it: what per cent. interest did he pay?

4. At what per cent. interest must £2,350 be lent to gain £47 in 4 months?

5. At what per cent. interest must £1,925 be lent to gain £154 in 1 year.

6. A man has £12,000, from which he receives £900 interest annually: how much per cent. is that?

7. A man deposited £2,600 in a bank, and received £143 interest annually: how much per cent. was that?

8. A man invested £4,500 in the London and Westminster Bank, and received a half-yearly dividend of £157 10s: how much per cent. was the dividend?

9. A man paid £1,625 for a house, and let it for £97 a year: how much per cent. did it pay?

10. A house which cost £2,500, was rented for £125 a year: how much per cent. did it pay on the cost?

11. A capitalist invested £5,000 in manufacturing, and received a half-yearly dividend of £125: how much per cent. was his dividend?

PROBLEM III.

To find the PRINCIPAL, *the interest, the rate per cent., and the time being given.*

12. What sum must be put at interest, at 6 per cent., to gain £75 in 2 years?

Analysis.—The interest of £1 for 2 years at 6 per cent. (the given time and rate) is $\frac{12}{100}$ of its principal £1; consequently, £75, the given interest, must be $\frac{12}{100}$ of the principal required. The question therefore resolves itself into this: £75 is $\frac{12}{100}$ of what number of pounds? If £75 is $\frac{12}{100}$, $\frac{1}{12}$ is $\frac{1}{12}$ of £75, which is £6 6s.; and $\frac{100}{12}$ = £6 5s. × 100, which is £625, the principal required.

Or, we may reason thus: Since $£\frac{12}{100}$ is the interest of 1 pound for the given time and rate, 75 pounds must be the interest of as many pounds for the same time and rate, as the times that $£\frac{12}{100}$ is contained in 75 pounds. And £75 ÷ $\frac{12}{100}$ = 625. Ans. £625.

PROOF.—£625 × ·06 = £37·50, the interest for 1 year at the given rate per cent., and £37·50 × 2 = £75, the given interest. Hence,

To find the *principal*, when the interest, rate per cent., and time are given.

Divide the given interest by the interest of £1 *for the given time and rate, expressed in decimals; and the quotient will be the principal required.*

Or, make the interest of £1 *for the given time and rate the numerator, and* 100 *the denominator of a vulgar fraction; then divide the given interest by this fraction, and the quotient will be the principal required.*

13. What sum must be put out at 7 per cent. interest, to gain £63 in 6 months?

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14. What sum must be put out at 5 per cent. interest, to gain £90 in 4 months?
15. What sum must be invested in 3 per cent. stock, to gain £300 in 6 months?
16. What sum must be invested in 4 per cent. stock, to gain £560 in one year?
17. A man founded a professorship with a salary of £400 a year: what sum must be invested at 7 per cent. to produce it?
18. What sum must be put out at 6 per cent. interest, to pay a salary of £120 a year?
19. What sum must be invested in 5 per cent stock to make a half-yearly dividend of £75?
20. A man bequeathed his wife £125 a year: what sum must be invested at 6 per cent. interest to pay it?

Problem IV.

To find the TIME, *the principal, the interest, and the rate per cent. being given.*

21. A man lent £200 at 6 per cent., and received £42 interest: how long was it lent?

Analysis.—The interest of £200 at 6 per cent. for 1 year is £12. Now, since £12 interest requires the principal 1 year at the given per cent., £42 interest will require the same principal $\frac{1}{12}$ of 1 year, which is equal to $3\frac{1}{2}$ years.

Or, we may reason thus: If £12 interest requires the use of the given principal one year, £42 interest will require the same principal as many years as £12 is contained times in £42. And £42 ÷ £12 = 3·5. Ans. 3·5 years. Hence,

To find the *time*, when the principal, interest and rate per cent. are given.

Divide the given interest by the interest of the principal at the given interest for 1 year, and the quotient will be the time required.

Or, make the given interest the numerator, and the interest of the principal for 1 year at the given rate the denominator of a common fraction; reduce this fraction to a whole or mixed number, and it will be the time required.

If the quotient contains a decimal of a year, it should be reduced to months and days.

22. A man lent £765 10s. at 6 per cent., and received £163 14s. 4½d. interest: how long was it lent?
23. In what time will £850 gain £29 15s. at 7 per cent. per annum?
24. A man received £136 15s. for the use of £1,820, which was 6 per cent. interest for the time: what was the time?
25. In what time will £6,280 gain £471, at 5 per cent. interest?
26. How long will it take £100, at 5 per cent., to gain £100 interest; that is, to double itself?

Operation.
£5)100
20 Ans. 20 years.

The interest of £100 for 1 year, at 5 per cent., is £5.

PROOF.—£100 × ·05 × 20 = £100, the given principal.

TABLE

Showing in what time any given principal will double itself at any rate, from 1 to 20 per cent. Simple Interest.

Per ct.	Years.	Per ct.	Years.	Per ct.	Years	Per ct.	Years.
1	100	6	16⅔	11	9 1/11	16	6¼
2	50	7	14⅔	12	8⅓	17	5 12/17
3	33⅓	8	12½	13	7 9/13	16	5⅝
4	25	9	11⅑	14	7⅐	19	5 15/19
5	20	10	10	15	6⅔	20	5

27. How long will it take £365 to double itself, at 6 per cent.?
28. How long will it take £1,161 to double itself, at 7 per cent.?
29. In what time will £2,365 4s. 9½d. double itself at 7 per cent.?
30. In what time will £5,640 double itself, at 10 per cent.?
31. How long will it take £10,000 to gain £5,000, at 6 per cent. interest?
32. A man borrowed £15,000 at 7 per cent., and retained it till the principal and interest amounted to £25,000: how long did he have it?
33. A man lent his nephew £25,000 to go into business, and agreed to let him have it, at 5 per cent., till it amounted to £60,000: how long did he have it?

COMPOUND INTEREST.

Compound Interest is the interest arising not only from the principal, but also from the *interest itself*, after it becomes due.

Compound Interest is often called *interest upon interest*. When interest is paid on the *principal only*, it is called *Simple Interest*.

Ex. 1. What is the compound interest of £842 for 4 years, at 6 per cent.?

Operation.

£842·00 Principal.
£842 × ·06 = 50·52 Int. for 1st year.
892·52 Amt. for 1 year.
£892·52 × ·06 = 53·55 Int. for 2nd year.
946·07 Amt. for 2 years.
£946·07 × ·06 = 56·76 Int. for 3rd year.
1002·83 Amt. for 3 years.
£1002·83 × ·06 = 60·17 Int. for 4th year.
1063·00 Amt. for 4 years.
842·00 Prin. deducted.
Ans. £221·00 Compound int. for 4 years

Hence, to calculate compound interest.

Calculate the interest on the given principal for one year, or the specified time, and add it to the principal; then calculate the interest on this amount for the next year, or specified time, and add it to the principal as before. Proceed in this manner with each successive year of the proposed time. Finally, subtract the given principal from the last amount, and the remainder will be the compound interest.

2. What is the compound interest of £600 for 5 years at 7 per cent.? Ans. £241 10s. 7½d.
3. What is the compound interest of £1,260 for 5 years at 7 per cent.?
4. What is the amount of £1,535 for 6 years at 6 per cent. compound interest?
5. What is the amount of £4,000 for 2 years at 7 per cent., payable half-yearly?

LESSONS IN GREEK.—No. LV.

By JOHN R. BEARD, D.D.

ATTRIBUTIVES, THE DEMONSTRATIVE PRONOUNS, THE ARTICLE.

AMONG attributive words of adjective signification, stand the demonstrative pronouns and the article, as well as the possessive pronouns.

The demonstrative pronouns indicate the local relation borne by an object to the speaker, and so may be divided into two classes, the near (this) and the remote (that); *e.g.*

Demonstrative Pronouns.

The near { ὁ, ἡ, το, this man, this woman, this thing
ὁδε, ἡδε, τοδε, a strengthened form of the same
οὗτος, αὕτη, τοῦτο, this man, etc.

The remote ἐκεῖνος, ἐκείνη, ἐκεῖνο, that man, that woman, etc.

Let not the student be surprised to find ὁ, ἡ, το, which hitherto he knows only as the article, placed here at the head of demonstrative pronouns. Originally ὁ, ἡ, το was exclusively a demonstrative pronoun. As such it is used in

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Homer. Only by degrees was the meaning softened down into that of the article. And still are there traces of the original acceptation found in prose authors, in ὁ μεν—ὁ δε, that person—this person, the one—the other; where the particles μεν and δε standing separately may be compared with the particle δε united with ὁ, ἡ, το, in what is commonly called a demonstrative pronoun. The passing of the demonstrative pronoun into the article will not surprise you, if you reflect how near the two are in meaning; *the man*, and *this man* vary very little, and our *the* is a curtailed form of *this*.

You will easily recognise the fact that ὁδε, ἡδε, τοδε is nothing more than the article with δε appended. It is not so obvious, but nevertheless it is equally true, that οὗτος, αὑτη, ταῦτα is only the article with its stem strengthened.

The two demonstratives ὁδε and οὗτος, of the same origin, resemble each other in signification. A slight difference may be discovered in them, namely, that ὁδε relates rather to outward and local objects, αὗτος embraces also the inner relations or states of mind; the former, therefore, excludes and the latter includes the individual peculiarities of an object. Opposed to both is ἐκεῖνος, in so far as it indicates an object which stands at a distance from the speaker. On these general facts are founded the following distinctive remarks relatively to the use of these pronouns.

Ὁδε and οὗτος differ from each other thus, that ὁδε alludes to an object not observed in its condition and consequently not so mentioned; while οὗτος refers not merely to an object itself, but also to its character; thus, ἡδε ἡ πολις is this city, the city which we see, the city in which we live, without any reference to its circumstances; on the contrary, αὑτη ἡ πολις is this city, considered relatively to its character, the (a) city of this kind. So ταῦτα is used of that which has been already spoken of; ταδε of that of which you have to speak; e.g.

Ταῦτα μεν συ λεγεις, παρ ἡμῶν δ' απαγγειλε ταδε
You report these things; bear back from us this answer.

Ταῦτ' ἐλεξαν, these things they said, that is, the things reported, is used at the end of a discourse or narrative, as the announcement of some utterance now known; but ἐλεξαν ταδε, they said these things, that is, those things are to follow, the nature of which is as yet unknown.

If the demonstrative refers to a relative or appositive proposition which contains a description of the nature of the subject, than commonly οὗτος is employed. Rarely is ὁδε used in such a connexion.

Οὗτος and ἐκεῖνος differ in this, that the former refers to the nearer, the latter to the remoter object. But this application is sometimes inverted. It is inverted when the remote object is pointed out as specially worthy of attention, and the nearer as holding an inferior position.

Οὗτος is used emphatically in order to indicate an object as universally known; ἐκεῖνος, in order to point out an object as prominent and distinguished of its kind.

Both pronouns are united in the form τοῦτ' ἐκεῖνο, when reference is made to a generally known object as such, and as previously mentioned.

The Greeks, especially the poets, employed the demonstrative to indicate emphatically proximity and remoteness in space, sometimes affixing the particle σι, as in our vulgarism, this *here*, that *there*. They also used them in conjunction with other pronouns, e.g.—ἡμεῖς οἱδε, we here; ἀεῖνος ὀγε, he there; ὃ συ λεγεις τοῦτο, what you say.

The demonstratives are omitted, first, when they stand with a relative clause, as a periphrasis for a substantive, e.g. αληθῆ ἁ συ λεγεις; and secondly, in these phrases—τεκμηριον δε, this is the proof; σημειον δε, this is the token; αἰτιον δε, the ground is this; κεφαλαιον δε, the chief point is, etc.; and the like.

The weakest form of the demonstrative pronoun, namely, ὁ, ἡ, το, is in good prose used only as an article. The office of the article is to individualise the idea conveyed in the noun, that is, to set it forth as a distinct object clearly present to the thought of the speaker and hearer. In general the use of the article on the part of the Greeks is the same as the use of it in English. There are, however, some deviations.

The Greeks use the article with proper names, but not universally; the article with proper names adds to the distinctness and individuality of the name, indicating that the person is well known, either because mentioned before, or because celebrated; thus, ὁ Κῦρος, the Cyrus previously spoken of, the Cyrus whom every one knows; so ὁ Αλεξανδρος, not any one so called, but some special Alexander; so also αἱ Αθῆναι, ἡ Σπαρτη, the famous city of Athens, of Sparta. Generally the noun is without the article when a distinctive or characterising phrase is added, as

Κῦρος, ὁ των Περσων βασιλευς, απεθανεν
Cyrus, the king of the Persians, died

The article is put also before substantives which have a pronominal attribute; as a demonstrative pronoun, or the determinative αυτος, self. The place of the article is either between the pronoun and the noun, as αὑτη ἡ οικια, this house, or before the noun and the pronoun, as ἡ οικια αὑτη; so ὁδε ὁ λογος, and ὁ λογος ὁδε; ἐκεῖνο το χωριον and το χωριον ἐκεῖνο; αυτος ὁ πατηρ and ὁ πατηρ αυτος.

The article is not employed when the demonstrative indicates the local relation of the noun to the speaker or the hearer. The article is unnecessary with αυτος when the substantive is a proper name, as αυτον Μενωνα.

The article does not accompany substantives which have a possessive pronoun, when an object is represented only as a part or member of a species of property, but the article is used if the possession is set forth either as an individual or an exclusive thing.

The possessive pronoun in this case takes the position of an adjective; *e.g.*—ἐμος υἱος, a son of mine; ὁ ἐμος υἱος, my son, either a definite and marked son, or an only son; αγροι σοι, the lands that belong to thee; οἱ σοι αγροι or οἱ αγροι οἱ σοι, thy lands, either all thy lands, or an already known part.

The article is used with nouns which signify a number, whether of special or general import, when reference is made to a number of objects, either previously mentioned or commonly known, or a number of objects in contrast with the remainder, or a number given as comprising a totality, no one being excluded, equivalent to our *in all*; and consequently the article is employed with numerals without nouns, when the idea of number appears as containing in itself a complete whole, considered in its arithmetical value. Special numerical determinations appear in the place of ordinary adjectives; general ones in the place of the demonstrative pronouns. Καθ' ἑκαστην την ἡμεραν is every day without exception; less emphatic is καθ' ἑκαστην ἡμεραν; παντες οἱ ανθρωποι, all the mentioned men; οἱ παντες ανθρωποι, all men, all men without exception, more expressive than παντες ανθρωποι.

To the numerals of general import may be added πολυς and αλλος. With πολυς the article is employed when a greater portion is set in contrast with a smaller portion. In such cases we in English use the superlative; *e.g.*—ὁ πολυς λογος, most of the speech; τα πολυ του στρατευματος, the main body of the army; τα πολλα, for the most part; οἱ πολλοι, the most, the bulk, the common people. Αλλος takes the article when the whole of the part of an object is exhibited in opposition to one mentioned part, or more, of the same object; *e.g.*—οἱ αλλοι ανθρωποι, the other men, the rest. When in English we use *another* or *the other* to signify that the subject and the object are of the same kind, the Greeks repeat the noun; *e.g.*

χειρ χειρα νιζει
hand washes hand (that is)
one hand washes another.

The article is employed in sums total; *e.g.*

ην, ὁτε τελευτησεν, αμφι τα ἑξηκοντα ετη
when he died he was about sixty years of age.

This is a usage with which we have nothing in common. It has been said that the article is here employed to point out the grammatical form of the numerals, which are without a grammatical form, being indeclinable.

Appellatives receive the article not only when reference is made to already mentioned or well known objects, but also to denote an entire species when taken as a whole in and for itself, or in contrast with another species; moreover, to mark an individual of a class when that individual appears as that

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which is suitable, correspondent, or requisite; as, *το μερος των ψηφων*, the required number of votes.

By receiving the article the infinitive acquires the form of a noun, yet may it retain its verbal force. Thus, it takes an adverb as a qualifier, as, *το καλως αποθανειν*, to die honourably, that is, an honourable death; it may have its object, as, *το τους νικησαντας αμελειν*, to neglect those who have gained a victory, that is, disregard to conquerors; it may also have a subject, as, *το φθονειν τοις ευτυχουσι τους ατυχουντας*, for the unfortunate to envy the fortunate. This infinitive itself, like nouns in general, may be the subject or the object of a proposition, or it may be the object after a preposition, all the while retaining its verbal force. Instances are found in the exercise, and these should be studied with special care, as under this head stand many important Greek idioms. The infinitive in Greek corresponds with the gerund in Latin; *e.g.*

Greek.	*Latin.*	*English.*
ενεκα του λεγειν	*dicendi*	of saying
εν τω λεγειν	*dicendo*	by saying
προς το λεγειν	*dicendum*	to saying, or to say.

Adverbs of place and time by taking the article acquire the import of substantives; as, *το ανω*, the upper region; *το μεταξυ*, the interval; *το περαν*, the other side (of the river); *το εντος*, the interior; *το νυν*, the present time; *το επειτα*, the future; *το προιν*, the past. Also adverbs of quality having the article take the form of nouns, *το σφοδρα*, intensity; *το λιαν*, excess; *το λαθρα*, secrecy. Adverbs in combination with the article stood for adjectives; as, *οι τοτε ανθρωποι*, literally, the then men, the men of that time; *αι ενθαδε γυναικες*, the there women, the women who are there.

The article with a genitive stands substantively, and in English requires a noun to be supplied; *e.g.*—*τα των Αθηναιων*, the (affairs) of the Athenians; *οι εν τη πολει*, the (men) in the city. In a similar manner it is taken with prepositions; as, *τα μετα ταυτα*, what followed; *η καθ' ημεραν τροφη*, our daily food; *η ξυγκομιδη εκ των αγρων εις το αστυ*, the supply from the country to the city.

Adjectives and participles, as well as adverbs, become nouns under the influence of the article; as, *οι πλουσιοι*, the rich; *ο λεγων*, the speaker; *ο πελας*, the neighbour. Sometimes the participle with the article is rendered by several words; as, *οι παροντες*, those who are present; *ο βουλομενος*, any one that pleases.

The article in the neuter gender prefixed to a noun, or to a phrase, denotes a quotation; as, *το ανηρ*, the word *ανηρ*; *το γνωθι σεαυτον*, the command "know thyself."

The article, inasmuch as it individualises, may hold the place of a possessive pronoun. In general the possessive pronouns are little used in Greek, being rendered unnecessary by the article, or being replaced by the genitive of the personal or the reflective pronoun; *e.g.*

ο σος δουλος	better *σου ο δουλος*	or	*ο δουλος σου*
thy slave	of thee the slave		the slave of thee.

When an attribute is added to a noun accompanied by the article, the position of the words may be threefold; *e.g.*

1. *τα μεγαλα αγαθα*	*η σφοδρα επιθυμια*
the great benefits	the intense desire
2. *αγαθα τα μεγαλα*	*επιθυμια η σφοδρα*
3. *τα αγαθα τα μεγαλα*	*η επιθυμια η σφοδρα.*

These three collocations vary in emphasis in the order in which they are placed, the first being the least, and the third the most emphatic.

A difference of meaning is produced by the different positions of the adjectives, *μεσος*, *ισχατος*, *ακρος*, etc.; *e.g.*

εν μεση τη αγορα or *εν τη αγορα τη μεση*;	*εν τη μεση αγορα*
in the middle of the market	in the middle market.

With a genitive case, a noun and an article may have different arrangements; *e.g.*

ο των Αθηναιων δημος
the people of the Athenians
ο δημος ο των Αθηναιων
των Αθηναιων ο δημος
ο δημος των Αθηναιων.

These arrangements vary only in emphasis.

The article is wanting in Greek with abstract appellatives when they denote the general idea; thus,

πλουτος κακιας υπηρετης εστιν
riches is a servant of wickedness.

The use or the non-use of the article with nouns of general import depends very much on the conception in the mind at the time. If I say, *ανθρωπος εστι θνητος*, man is mortal, I make the most general statement I can make—man, the race so called, considered as the race, is mortal. But I may also say, *ο ανθρωπος εστι θνητος*, *the* man is mortal, that is, a particular men considered as the representative of the race. So *φιλοσοφια* is philosophy in general, but *η φιλοσοφια* is philosophy as a special branch of knowledge.

The omission of the article sometimes gives the force of our indefinite *an* or *a*; that is, *one* of the race so called, or the race itself, *ανθρωπος*. If indefiniteness is to be given, you add the enclitic *τις* to the noun; *e.g.*

γυνη τις ορνιν ειχεν
a certain woman had a hen.

A noun taken with *πας* and without the article, is used distributively, as *πας ανθρωπος*, every man; *παντες ανθρωποι*, all men, considered individually. If you add the article, you give a collective force, as *παντες οι ανθρωποι*, all the men (in the world), men collectively. So *η πασα γη*, the whole land.

An important difference is made by the different position of the article with *αυτος*; *e.g.*

αυτος ο πατηρ or *ο πατηρ αυτος*
the father himself.
ο αυτος πατηρ or *ο πατηρ ο αυτος*
the same father.

Exercises.—Greek-English.

Οταν ταυτα λεγωμεν, τοδε λεγομεν. Ον αν ηγησωνται φρενιμωτερον εαυτων ειναι, τουτῳ οι ανθρωποι υπεραδικως πειθονται. Μονῳ ιατρῳ τουτο και συνηγορῳ εξεστιν, αποκτεινειν μεν, αποθνησκειν δε μη. Ουτος αν ειη σωφρονεστατος, οστις κοσμιωτατα τας συμφορας φερειν δυναται. Οστις δε τους τεκοντας εν βιῳ σιβει, ουδ' εστι και ζωντων θεοις φιλος. Δει το βελτιστον αει, μη το ῥᾳστον απαντας λεγειν· επ' εκεινο (το ῥᾳστον) μεν γαρ η φυσις αεπη βαδιζεται, επι τουτο (το βελτιστον) δε τῳ λογῳ δει παραγεσθαι διδασκοντα τον αγαθον πολιτην. Αριστοκρατους εστιν εν Πυθοῖ τουτο το καλον αναθημα. Πολλοι παρα τοις Αθηναιοις γεγονασι ῥητορες ενδοξοι και μεγαλοι προ τοῦ Δημοσθενους, Καλλιστρατος εκεινος, Αριστοφων, Κεφαλος, Θρασυβουλος, ταῦτ' εκεινα τα ειωθοτα. Παρεισι Κριτων ουτοσι, Κριτοβουλον τοῦδε πατηρ, Αισχινου τουτου πατηρ. Ουτοσι αὐτὴρ ου παυσεται φλυαρῶν. Νῆες εκειναι επεπλεουσιν. Τι οὖν δε τουτολεγεις; Ωσπερ αν ψ ὸς ειμι. Εισιν οι οιονται. Κῦρος επι τον αδελφον Αρταξερξην εστρατευετο. Θηβαι αι εν βοιωτιᾳ ετμηθη ὑπο του Αλεξανδρου. Λακεδαιμονιοι της Πελοποννησου των πεντε τας δυο μοιρας νεμονται. Η ταξις εκαστη εφ' ενος εστω. Τα δωδεκα εστι δις εξ. Αμφοτερα τα ωτα απετεμεν. Αδελφος αθελφῳ φθονει. Νηες πλειους των εκατον επλευσαν. Αθηναιοι πλευσαντες ναυσιν ἱξηκοντα επι Σαμου ταῖς μεν εκκαιδεκα των νεῶν ουκ εχρησαντο. Τας τιμωριας ὁ Σολων τοῖς μεν ιδιωταις επουησε βραδειας, ταις δε αρχαῖς και τοῖς δημαγωγοις ταχειας. Απεστειλε τας πεντηκοσιας ἑραχμας. Ὁ Κῦρος ὑπισχνεῖται δωσειν τρια ἡμιδαρεικα του μηνος τῳ στρατιωτῃ. Χρη το αυτο φθεγγεσθαι τον ῥητορα και τον νομον. Τοιοῦτος γιγνου περι τους γονεῖς οιους αν ευξαιο περι σεαυτον γενεσθαι τους σεαυτοῦ παῖδας. Τους υιεις οι πατερες ωργουσιν απο τῶν πονηρων ανθρωπων. Το εν

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πραττειν παρα την αξιαν αφορμη τοῦ κακῶς φρονειν τοις ανοητοις γιγνεται. Το τους νικησαντας αμιλλᾶν μεγα ἁμαρτημα. Οἱ πολλοι ὡρμηκοτες επι το σκοπειν τα τῶν αλλων πραγματα ου τρεπονται επι το ἑαυτους εξεταζειν. Το φθονειν τοῖς ευτυχοῦσι τους ατυχοῦντας ουδεν θαυμαστον. Αγησιλαος ουχ' οὑτως επι τῷ αλλων βασιλευειν ὡς επι τῳ ἑαυτοῦ αρχειν εμεγαλυνετο. Ὁ λυχνος δια το λαμπραν φλογα εχειν φῶς παρεχει. Καιρος εστι του λεγειν. Προς το μετριων δεῖσθαι πεπαιδευμενος εἰμι. Το φιλεῖν ακαιρως ισον εστι τῳ μισεῖν. Ὁ Ζευς την Αθηνᾶν εφυσεν εκ τῆς ἑαυτοῦ κεφαλῆς. Την εμην τυχην εξεταζων προς την σεαυτοῦ σκοπει, και εὑρησεις την εμην βελτιω τῆς σῆς. Οἱ Αθηναῖοι επεδειξαν και εν ταις δυστυχιαις την ἑαυτων αρετην. Μετεπεμψατο Αστυαγης την ἑαυτοῦ θυγατερα και τον παῖδα αυτῆς. Κῦρος ἠσθη τον εκ των Ἑλληνων εις τους βαρβαρους ψοφον ὀρων. Καλη και μεγαλη εστιν ἡ πολις ἡν πολιορκοῦμεν. Ἑκαστος τῶν δημιουργῶν την τεχνην καλῶς εξειργαζιτο. Εμαχεσαντο οἱ μετα Περικλεους ὁπλῖται χιλιοι. Οἱ των βασιλεων οινοχοοι διδοᾶσι τοις τρισι δακτυλοις οχοῦντες την φιαλην. Οἱ στρατιωται παντες (or παντες οἱ στρατιωται), καλῶς εμαχεσαντο. Οἱ στρατιωται εἱλον το στρατοπεδον ἁπαν (or ἁπαν το στρατοπεδον), Ποιειτω ταῦτο ὁ βουλομενος. Μη ζητεῖτε τον ταῦτα λεξοντα. Ἡ ανδρεια καλη εστιν. Το γαλα εστιν ἡδυ. Ὁ πλεῖστα ωφελων το κοινον μεγιστων τιμῶν αξιοῦται. Κακα και αισχρα επραξεν. Τα κακα και τα αισχρα επραξεν. Ὁ μονος παῖς παιζει. Μονος ὁ παῖς παιζει. Οἱ πολιμιοι απεκτειναν τους παντας πολιτας. Τί διαφερει ανθρωπος ακρατης θηριου του ακρατεστατου; Πᾶσαν ὑμιν την αληθειαν ερῶ. Τον αριθμον παντα διχα διελαβομεν. Δαρειος εβασιλευσε τα παντα ἓξ και τριακοντα ττη. Ενικησαν Θηβαῖοι Λακεδαιμονιους.

English-Greek.

The Thebans were conquered by the Lacedemonians. We came to the end of the mountain. We came to the farthest mountain. They dwell in the upper city. They cultivate the country beyond the river. Every woman is mortal. All women are mortal. The same woman dies. That woman speaks. The woman herself speaks. He obeys the law. He obeys a law. He obeys the same law. He obeys the law itself. To obey the law is good. The wise say, that for men to obey the laws is good. In obeying the laws of God, men become happy. Every man becomes wise in obeying the laws of God. All the citizens march to battle. The battle is deadly. Hasten, O young men, to the battle. My father died being sixty years old. The soldiers in all are forty thousand. This man is wise, that man foolish. Those who speak, will have great power. He who obeys the laws, is loved by God. Mothers love their children. Children are loved by their mothers. Those brave warriors will be accounted worthy of great honours.

LESSONS IN SPANISH.—No. VIII.

We would recommend to the learner to review carefully all the preceding lessons, especially the last four; and then, after having attentively studied the following rules, to translate the ensuing exercise,

In Spanish, the definite article is to be used before all common nouns taken in a general sense, or which denote a whole class or species of things; as, *la paciéncia y la actividad remueven montañas*, patience and diligence remove mountains; *le prohiben el uso del vino*, they forbid him the use of wine; *jamas la sobérbia ni la ira podrán acordarse con la amabilidad y la mansedumbre*, never can pride or anger agree with amiability and meekness; *todas las cosas tienen su tiempo*, all things have their season. Here patience, diligence, wine, pride, anger, amiability, meekness, and things, are taken in an absolute or general sense, and each requires the definite article in Spanish, though not in English, to precede it.*

* This is an important rule of Spanish syntax, and it should be well studied by the learner

The definite article is not to be used in Spanish before nouns not taken in a general or determinate sense, or which do not refer to the whole class or species of things, or the whole of any object; as, *ella tiene azúcar*, she has sugar; *Juan bebe vino al almuerzo*, John drinks wine at breakfast. Here sugar and wine are to be taken in a partitive sense, meaning "some sugar," "some wine."

Vocabulary.

Caridad, charity.	*Año*, year.
Beneficéncia, beneficence.	*Harina*, flour.
Ignorância, ignorance.	*Yelo*, ice.
Error, error.	*Religion*, religion.
Vida, life.	*Gratitud*, gratitude.
Sueno, dream, sleep.	*Hermosura*, beauty.
Tiempo, time.	*Juicio*, judgment.
Virtud, virtue.	*História*, history.
Vicio, vice.	*Maestra*, mistress, instructress.
Paz, peace.	*Justicia*, justice.
Sociedad, society.	*Riqueza*, wealth, riches.
Muerte (fem.), death.	*Leche* (fem.), milk.
Paciente, patient.	*Útil*, useful.
Precioso, precious.	*Caro*, dear.
Mejor, better.	*Frio*, cold.
Mortal, mortal.	*Blanco*, white.
Odioso, odious.	*Dulce*, sweet.
Terrible, terrible.	*Necesário*, necessary.
Juan hace, John makes,	*Ella teme*, she fears.
Pedro prefiere, Peter prefers.	*El depende*, he depends.

Model Sentences.

El hombre es polvo, man is dust.

La hermosura es despojo del tiempo, beauty is the spoil of time.

El despotismo los embrutece, la severa disciplina[1] militar[1] los degrada, la superstícion los condena al error y á la ignorância, despotism stupefies them, severe military discipline degrades them, superstition condemns them to error and ignorance.

El alma de la muger es naturalmente mas sensible que la del hombre, the soul of woman is naturally more sensitive than that of man.

El hambre es la mejor salsa, hunger is the best sauce.

Spanish-English.

El tiempo * es mas precioso que el oro. La caridad es paciente. La beneficéncia nos hace amables. La vida no es un sueno. El tiempo es precioso. La ignorância es madre del error. El água es tan buena como el vino. La sabiduria es mas preciosa que todas las riquezas. La prudéncia es mas preciosa que la plata. Mejor es la sabiduria que la hermosura. El hombre teme la muerte. El hombre no teme la vida. La virtud es amable. El vício es odioso. Los hombres son mortales. El oro es precioso. La prudéncia es útil. Ella tiene prudéncia. Juan tiene oro. El dinero es útil. Pedro tiene dinero. Los libros son útiles. María no halló libros. Este año la harina es muy cara. Los vinos están buenos este año. El vino es muy caro este año. La manteca es muy cara. La cerveza es buena. El yelo es frio. La muerte es terrible. La leche es blanca. El asúcar es dulce. La gratitud es el alma de la religion. Juan prefiere el vicio á la virtud. María no prefiere el error á la verdad. Pedro prefiere las riquezas á la sabiduria. El médico prefiere la cerveza al vino. La prudéncia y el juicio son necesarios á todo hombre. La história es maestra de la vida. La paz de la sociedad depende de (en) la justicia. La plata es preciosa. Los tenedores son útiles. Este año la harina no es cara. La religion es amable. El oro es mas precioso que la plata. Mejor es la prudéncia que el dinero.

English-Spanish.

Time is precious. Prudence is useful. Vice is odious. Money is useful. Ice is cold. Sugar is sweet. Religion is

* The learner must not in these cases translate the article in English; thus, he must not render *el tiempo*, "the time," but "time." So, *el yelo es frio*, "ice is cold," and not "the ice is cold;" *la vida no es un sueno*, "life is not a dream;" and so on.

lovely (*amable*). Virtue is lovely. Books are useful. Time is more precious than gold. Ignorance is (the) mother of error. Prudence is more precious than silver. Water is as good as wine. Charity is patient. Life is not a dream. Wisdom is more precious than all riches. Beneficence makes us amiable. Wisdom[3] is[2] better[1] than beauty. Men are mortal. Men fears death. Man fears not life. Gold is precious. She has prudence. Peter has money. Lucy found no books. John has gold. Butter is very dear. Milk is white. Beer is good. This year flour is very dear. Wine is very dear this year. Death is terrible. Gratitude is the soul of religion. Prudence and judgment are necessary to every men. Wines will-be good this year. Peter prefers vice to virtue. The shoemaker prefers beer to wine. Forks are useful. This year flour is not dear. Gold is more precious than silver. History is (the) instructress of life. John prefers riches to wisdom. This gentleman prefers truth to arror. The peace of society depends on (*de*) justice. Prudence is better than money.

OF THE VERB.

Verbs are classed, as in English, into active, passive, and neuter; active-transitive, active-intransitive, reflective, regular, irregular, impersonal, and defective. They are also varied by person and number, mood and tense.

An *active* verb expresses an action affirmed of the agent or nominative; as,

Cláudio escribe, Claudius writes.

When the action is affirmed of the agent as being transmitted to a direct object, the verb is called *active-transitive*; as,

Cláudio escribe una carta, Claudius writes a letter.

When the verb expresses action, but has no direct object, it is called *active-intransitive*; as,

El esclamó, he exclaimed.
El mocito saltó, the lad jumped.

A *reflective* verb is one which affirms that the action is conveyed to the same person or thing which is the agent; as,

Tu te ceñes, thou girdest thyself.
Nosótros nos alabamos, we commend ourselves.
El se tiene por hombre grande, he holds himself for a great man.

A *passive* verb affirms that an action has been received or suffered by the agent; as,

Ellos fueron postrados, they were overthrown.

A *neuter* verb affirms merely the condition or state of existence of its agent, without any reference to a direct object; as,

El hombre existe, the man exists.
Yo vivo, I live.

Verbs have three persons and two numbers, as in English; that is, they vary their endings to agree with the person and number of their nominative; as,

Singular.	*Plural.*
1st Pers. *Yo hablo*, I speak.	1st Pers. *Nosotros hablamos*, we speak.
2nd Pers. *Tú hablas*, thou speakest.	2nd Pers. *Vosotros hablais*, you speak.
3rd Pers. *El habla*, he speaks.	3rd Pers. *Ellos hablan*, they speak.

In Spanish it is not necessary to use the personal pronouns of the nominative case with the verb (unless for the sake of emphasis or perspicuity), as the ending of the verb indicates the person of its nominative. Thus, *hablo* means I-speak; *hablas*, thou-speakest; *habla*, he-speaks or she-speaks; *hablamos*, we-speak, etc.

Moods

Mood is the form which the verb takes to show in what manner the action or existence is represented. In Spanish there are four moods; the infinitive, the indicative, the imperative, and the subjunctive.

The *infinitive* mood expresses action or being in an indefinite manner, without reference to person or time; as,

Hablar, to speak. | *Comer*, to eat.

The *indicative* mood represents the affirmation in a positive manner; as,

Hablamos, we-speak. | *Comeré*, I-shall-eat.

The *imperative* mood expresses an order, entreaty, or command; as,

Hablád, speak-ye.
Coman, let-them-eat, or, may-they-eat.

The *subjunctive* mood represents the affirmation in a conditional manner; as,

Aunque hablen, though they-may-speak.
Yo comeria, I would-eat.

Tenses.

Tense is the form which the verb takes to show the time of the action, being, or passion which is affirmed. There are properly three tenses, the *past*, the *present*, and the *future*. These are subdivided into eight tenses, one for the present, five for the past, and two for the future: the present; imperfect, perfect-definite, perfect-indefinite, the first-pluperfect, second-pluperfect; the first-future, and future-perfect or second-future.

The *present* tense represents whatever is affirmed as taking place at the present time; as,

Hablan, they-speak.
Están comiendo, they-are eating.

The *imperfect* tense represents as relatively present something which is affirmed as past, though, for all we know to the contrary, not yet completed; as,

Hablaban cuando los vió, they were-speaking when he-saw them.

The *perfect-definite* tense represents what is affirmed as being completely past and finished; as,

Les habló ayer, he-spoke to them yesterday.

The *perfect-indefinite* tense represents what is affirmed as having taken place during a time not entirely elapsed; as,

Les he hablado hoy, I-have spoken to them to-day.

The *first-pluperfect* tense expresses what is past and was finished before another action, also past, completed; that is, an event which occurred prior to some other past event; as,

Habia hablado cuando llegó, I-had spoken when he-arrived.

The *second-pluperfect* expresses that what is affirmed had taken place immediately before a time which is past; and is always employed after adverbs of time; as,

Cuando les hubo hablado, se marcharon, when he-had spoken to-them, they went away.

The *first-future* tense refers to some action or event which is yet to take place; as,

Hablará esta noche, he-will-speak to-night.

The *second-future* or *future-perfect* tense refers to some future action or event that will have taken place at or before some particular future time; as,

Habré acabado á las ocho, I-shall-have finished at eight o'clock.

Participles and Gerunds.

Verbs in Spanish have two participles, the *present* and the *past*. There are, however, but few present participles in use, and these few are, almost without exception, employed only as adjectives or nouns; as, *semejante*, similar; *obediente*, obedient; *viajante*, traveller. The ending of the present participle of verbs that have their infinitive in *ar*, is *ante*; of those that have their infinitive in *er* or *ir*, it is *iente*.

The *past participle* denotes action or being perfected or

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finished, and, when derived from a regular verb, is generally formed by changing the final letters of the infinitive *ar* into *ado*, and *er* or *ir* into *ido*; as,

Hablado, spoken. | *Comido*, eaten.

The *gerund* in Spanish is equivalent to the present participle in English; and is formed by changing the final letters of the infinitive in *ar* into *ando*, and *er* or *ir* into *iendo*; as,

Hablando, speeking. | *Comiendo*, eating.

Conjogation.

In Spanish the infinitive mood of all verbs ends in *ar*, *er*, or *ir*, and these terminations serve to distinguish the three conjugations; the *first* conjugation comprehending all verbs onding in *ar*; the *second*, those ending in *er*; and the *third*, those ending in *ir*.

Regular verbs are those whieh are conjogated through all the moods and tenses without deviating in their orthography from the corresponding orthography of the model verbs.

Irregular verbs are those which do not conform in every respect to the regniar standard or model verbs.

Auxiliary or *helping* verbs aro those by the aid of whieh othera are conjugated in the compound tensee and in the passive voiee. The auxiliary verbs are *haber*, to have; *ser*, to bo; *estar*, to be. Those tenses of the active voice in which an auxiliary verb is used, ore eailed *compound* tenses.

Remark.—The learner must keep in mind the rules for eceenting the verb in all its varieties of termination; and he will thus know that all persons of the verbs (of whatever mood or tense) which havo no accent over any syllable are to be aceented on the syllablo next to the last.* In somo of the conjugatione, tho accent will be placed over all the forms, in order to aid the etudent in pronounneing them.

LESSONS IN READING AND ELOCUTION.

No. XXIV.

THE PRESS.

Looк abroad, over the face of this vast and almost illimitable continent, and behold multitudes which no man ean number, impatient of the slow process of education, wrestling with the powers of nature and the obstructions of accident, and like the patriarch, refusing to let go their hold, till the day breaк, and they receive the promised hiessing, and the recompense of the struggle.

You will perceive, too, in the remotest corners where civiliзation has planted her standard, that there tho Press, the mightiest engine ever yet invented by the genius of man, is producing a moral revolution, on a scale of grandeur and magnifieence unknown to all former generations. By it information of every transaction of government, and of all important occurrences in the four quarters of tho world, is transmitted with a degree of speed and regularity, that the most sagacious could not have foreseen, nor the moet enthusiastio havo dared to hope for, fifty years ago. By the Prees, every cottage is supplied with its newspaper, and elementary books in the most useful sciences; and every cradle is supplied with traets and toy-books, to teach the infant to lisp lessons of wisdom and piety, long before his mind has power to conceive, or firmness to retain, their meaning.

Tho power of this engine, in the moral and intellectual universe, is ineonceivablo. There is no ordinary operation of tho physical elements to which its mighty influence can be compared. We ean find only in the visions of the apocalyptic saint a parallel to its tremendous action. Guided hy truth and reason, like the sound of the seventh trumpet, it opens the temple of God in heaven, and shows to the eyo of the faithful and regenerated epirit, within the veil of that temple, in the presence-chamber of the Almighty, the ark of his testament. Controlled hy falsehood and fraud, its force like the opening of tho sixth seal of the mystic volume, produces earthqnakes, turns the sun to sackcloth, and the moon to blood, moves every mountain and island out of their places, and causes even the heaven we hope for, to depart as a scroll when it is rolled together.—*Joseph T. Buckingham.*

GREECE IN 1820.

Land of the brave! where lie inurned
The shrouded forms of mortal clay,
In whom the fire of valour burned,
And blazed upon the hettle's fray;
Land where the gallant Spartan few
Bled at Thermopylæ of yore,
When death his purple garment threw
On Hellas' consecrated shore!

Land of the Muse! within thy bowers
Her soul entraneing echoes rung,
While on their course the rapid hours
Paused at the melody she suog;
Till every grove and every hill,
And every stream that flowed along,
From morn to night repeated still
The winning harmony of song.

Land of dead heroes! living slaves!
Shall glory gild thy clime no more?
Her banner float abovo thy waves,
Where proudly it hath swept before?
Hath not remembrance then a charm
To breaк the fetter and the chain;
To bid thy children nerve the arm,
And strike for freedom once again?

No! coward souls! the light which shone
On Leuctra's war-empurpled day,
The light which beamed on Marathon,
Hath lost its splendor, ceased to play;
And thou art but a shadow now,
With helmet shattered, spear in rust;
Thine honour but a dream, and thou
Despised, degraded in the dust!

Where sleeps the spirit, that of old
Dashed down to earth the Persian plume,
When the loud chant of triumph told
How fatal was the despot's doom?
The bold three hundred—where are they,
Who died on hattle's gory hreast?
Tyrants have trampled on the clay,
Where death has hushed them into rest.

Yet, Ida, yet upon thy hill,
A glory shines of ages fled;
And fame her light is pouring still,
Not on the living, but the dead;
But 'tis the dim sepulchral light,
Which sheds a faint and feehle ray,
As moon-beams on the hrow of night,
When tempests sweep upon their way.

Greeee! yet swake thee from thy trance;
Behold thy banner waves afar;
Behold the glittering weapons glance
Along the gleaming front of war!
A gallant chief of high emprize,*
Is urging foremost in the field,
Who calls upon thee to arise
In might, and majesty revealed.

In vain, in vain the hero calls;
In vain he sounds the trumpet loud;
His banner totters; see, it falls
In ruin, freedom's batile shroud;
Thy children have no soul to dare
Such deeds as glorified their sires;
Their valour's but a meteor'e glare,
Which gleams a moment and expires.

Except tha second person plural of the imperative mood.

* Ypsilanti.

Lost land! where Genius made his reign,
And reared his golden arch on high,
Where science raised her sacred fane,
Its summit peering to the sky;
Upon thy clime the midnight deep
Of ignorance hath brooded long;
And in the tomb, forgotten, sleep
The sons of science and of song.

Thy sun hath set, the evening storm
Hath passed in giant fury by,
To blast the beauty of thy form,
And spread its pall upon the sky;
Gone is thy glory's diadem,
And freedom never more shall cease
To pour her mornful requiem
O'er blighted, lost, degraded Greece!—*J. G. Brooks.*

TRYING TO PLEASE.

We know that it is difficult to draw the line between good social dispositions and actions generally, and a sickly regard to false exactions; and to avoid useless discriminations, we shall venture to say, that we dislike much of the current language on the subject of pleasing. We dislike the phrase, "trying to please." It is deceptive, and the practice itself leads to effeminacy or fraud. It puts men in wrong positions towards each other.

To shun giving needless offence is one thing, and most important. This passive good-will or negative benevolence is not sustained without effort; and, as it is little noticed by those whom it spares, it is likely to be disinterested, and can scarcely do harm to either party.

Then, again, to give innocent pleasure to others by active efforts and personal sacrifices in their behalf, is safe for all concerned. And to gratify our friends by our moral excellence and high reputation, is a natural reward, though we should not propose it as the object of virtuous action. And undoubtedly our customary civilities and attentions are in part designed to give pleasure.

But Chesterfield's "passionate desire of pleasing everybody," this endeavouring so to adapt ourselves to the dispositions of others, that admiration and gratitude shall beam upon us whenever we appear, and our very persons become idols, is not the prompting or expression of benevolence; and it is foreign to the true spirit and purpose of civility. There is selfishness on both sides, and mutual mischief. Men have no right to such a show of devotion, and we have no right to offer it.

We are not placed here, solely or chiefly to please or to be pleased, even in the best sense that we can give to these terms; but to be good and to do good. And, so far as manners promote these objects, let them be cultivated with enthusiasm as virtues; and, so far as they *then* give pleasure, they yield a natural fruit.—*Edward T. Channing.*

THE WILD BOY.

He sat upon the wave-washed shore
With madness in his eye;
The surge's dash,—the breaker's roar,
Pass'd unregarded by;
He noted not the billows' roll,
He heeded not their strife,—
For terror had usurped his soul,
And stopped the streams of life.

They spoke him kindly,—but he gazed,
And offered no reply;—
They gave him food,—he looked amazed,
And threw the morsel by.
He was as one o'er whom a spell
Of darkness hath been cast;
His spirit seemed to dwell alone,
With dangers that were past.

The city of his home and heart,
So grand,—so gaily bright,
Now touched by fate's unerring dart,
Had vanished from his sight.
The earthquake's paralyzing shake
Had rent it from its hold,—
And nothing but a putrid lake,
Its tale of terror told.

His kindred there, a numerous band,
Had watched his youthful bloom,—
In the broad ruin of the land,
All—all had met their doom!
But the last night, a mother's voice
Breathed over him in prayer,—
She perished,—he was left no choice
But mute and blank despair.

He sat alone, of all the crowd
That lately thronged around,—
The ocean winds were piping loud,
He did not heed their sound;
They asked him of that city's fate,
But reason's reign was o'er,—
He pointed to her ruined state,
Then fled,—and spoke no more.

Charles West Thomson.

THE MOCKING-BIRD.

The plumage of the mocking-bird, though none of the homeliest, has nothing gaudy or brilliant in it; and, had he nothing else to recommend him, would scarcely entitle him to notice; but his figure is well proportioned, and even handsome. The ease, elegance and rapidity of his movements, the animation of his eye, and the intelligence he displays in listening, and laying up lessons from almost every species of the feathered creation within his hearing, are really surprising, and mark the peculiarity of his genius.

To these qualities we may add that of a voice full, strong and musical, and capable of almost every modulation, from the clear, mellow tones of the wood-thrush, to the savage screams of the bald eagle. In measure and accent, he faithfully follows his originals. In force and sweetness of expression he greatly improves upon them. In his native groves, mounted upon the top of a tall bush, or half-grown tree, in the dawn of a dewy morning, while the woods are already vocal with a multitude of warblers, his admirable song rises pre-eminent over every competitor.

The ear can listen to *his* music alone, to which that of all the others seems a mere accompaniment. Neither is this strain altogether imitative. His own native notes, which are easily distinguishable by such as are acquainted with those of our various song birds, are bold and full, and varied seemingly beyond all limits. They consists of short expressions of two, three, or, at the most, five or six syllables, generally interspersed with imitations, and all of them uttered with great emphasis and rapidity, and continued with undiminished ardour for half an hour, or an hour, at a time; his expanded wings and tail, glistening with white, and the buoyant gaiety of his action, arresting the eye, as his song most irresistibly does the ear. He sweeps round with enthusiastic ecstasy. He mounts and descends, as his song swells, or dies away; and, as my friend Mr. Bartram, has beautifully expressed it, "he bounds aloft with the celerity of an arrow, as if to recover or recall his very soul, which expired in the last elevated strain."

While thus exerting himself, a bystander, destitute of sight, would suppose that the whole feathered tribe had assembled together on a trial of skill, each striving to produce his utmost effect:—so perfect are his imitations. He many times deceives the sportsman, and sends him in search of birds that perhaps are not within miles of him, but whose notes he exactly imitates. Even birds themselves are frequently imposed on by this admirable mimic, and are decoyed by the fancied calls of their mates; or dive with precipitation into the depths of thickets, at the scream of what they suppose to be the sparrow-hawk.—*Alexander Wilson.*

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FRENCH READINGS.—No. XXX.

LES HIRONDELLES.

Captif au rivage du Maure,[1]
Un guerrier courbé sous ses fers,
Disait: je vous revois encore,
Oiseaux ennemis des hivers.
Hirondelles, que l'espérance
Suit[a] jusqu'en ces brûlants climats,[4]
Sans doute vous quittez la France:
De mon pays ne me parlez-vous pas?[4]

Depuis trois ans je vous conjure
De m'apporter un souvenir[5]
Du vallon où ma vie obscure
Se berçait d'un doux avenir,
Au détour d'une eau qui chemine[b]
A flots purs, sous de frais lilas,[6]
Vous avez vu notre chaumine;
De ce vallon ne me parlez-vous pas?[7]

L'une de vous peut-être est née[c]
Au toit où j'ai reçu le jour;[8]
Là d'une mère infortunée
Vous avez dû[d] plaindre l'amour.[9]
Mourante, elle croit à toute heure
Entendre le bruit de mes pas;[10]
Elle écoute, et puis elle pleure:[11]
De son amour ne me parlez-vous pas?[12]

Ma sœur est-elle mariée?[13]
Avez-vous vu de nos garçons
La foule aux nôces conviée,
La célébrer dans leurs chansons?
Et ces compagnons du jeune âge
Qui m'ont suivi dans les combats,
Ont-ils revu[e] tous le village?[14]
De tant d'amis ne me parlez-vous pas?[15]

Sur leur corps l'étranger, peut-être,
Du vallon reprend le chemin;[16]
Sous mon chaume,[f] il commande en maître;
De ma sœur il trouble[g] l'hymen.
Pour moi plus de mère qui prie,
Et partout des fers[h] ici bas,[17]. . .
Hirondelles de ma patrie,
De ses malheurs ne me parlez-vous pas?[18]

Bé'ranger.

Colloquial Exercise.

1. Où se trouvait le guerrier captif?
2. Que disait-il aux hirondelles?
3. Où l'espérance les suivait-elle?
4. Quelle question le prisonnier leur faisait-il?
5. De quoi les conjurait-il depuis trois ans?
6. Où était située la chaumine du guerrier?
7. Que demanda-t-il aux oiseaux?
8. Où était peut-être née une des hirondelles?
9. Qu'est-ce que les oiseaux ont dû plaindre?
10. Que croit entendre à toute heure la pauvre mère mourante?
11. Que fait la tendre mère?
12. Quelle question finit ce couplet?
13. Que demande le captif à l'égard de sa sœur?
14. A l'égard des compagnons de son enfance?
15. Quelle autre question le prisonnier fait-il?
16. Que fait peut-être l'étranger?
17. Qu'y a-t-il partout pour le prisonnier?
18. Que demande-t-il enfin aux hirondelles?

Notes and References—*a* from *suivre*; L. part ii., p. 100.—*b*. d'une eau qui chemine, *of a running stream*.—*c*. from *naître*; L. part ii., p. 96.—*d*. from *devoir*; L. part ii., § 52, R. (2).—*e*. L. S. 41, R 5.—*f*. chaume, *roof*; literally, *thatch*—*g*. trouble l'hymen, *disturbs the wedding*—*h*. fers, *chains*.

LE VIEUX ROI ET LA JEUNE FILLE.

Section I.

J'étais depuis deux mois à Londres;[1] les deux mois les plus brumeux de la brumeuse Angleterre. Enfin, vers la mi-février, à travers un voile de nuées grisâtres, j'aperçus comme une pâle copie de notre soleil de France, le soleil de la Grande-Bretagne.[2] J'avais besoin, pour respirer à l'aise, de sortir de l'atmosphère pesante[a] qui oppressait ma poitrine, et je résolus[b] d'aller guérir un méchant rhume à Richmond,[4] que j'avais si souvent entendu citer comme un des plus beaux lieux des environs de Londres.[5] Quittant avec plaisir mon hôtel noir et enfumé, je montai dans une légère et bonne diligence et arrivai en quelques heures[c] à la destination que je m'étais fixée.[b]

La vue qui s'offre au voyageur du haut de la terrasse de Richmond est des plus riantes et des plus gracieuses.[7] Devant ses yeux se déroule une forêt immense et épaisse,[8] qui semble dominer tout le pays, et au milieu de laquelle toutes les habitations ont l'air d'être[c] enfoncées[d] dans des épais et moelleux ombrages. De distance en distance s'étendent de belles pelouses,[10] qui ressemblent à ces clairières qui entrecoupent les bois,[11] où les cerfs, les biches et les faons[4] viennent bondir et jouer sous les rayons du soleil.[12]

C'est de la colline de Richmond que l'on voit le cours de la Tamise;[13] ce n'est point encore l'orgueilleuse reine des fleuves; ici elle est simple et modeste comme la villageoise qui n'a point encore vu la ville des rois.[14] Toute poésie à part, la Tamise est peu de chose à Richmond;[15] on ne dirait pas en la voyant si humble, que quelques milles plus loin, elle va devenir si puissante par ses ondes[16] et par ses richesses.

Après avoir déjeûné à l'hôtel de l'*Etoile*, j'allai visiter la maison du célèbre Pope.[17] Les princes d'Orléans l'habitaient alors.[18] Cette jolie *villa* devait être selon le cœur du poète anglais; elle est merveilleusement et tranquillement assise sur la pente très douce d'un coteau[19] qui forme pelouse devant le château et que baignent les ondes de la Tamise. Un énorme bouquet de chênes séculaires est comme la toile[e] de fond,[20] sur laquelle se dessine en clair l'élégante habitation.

Je consacrai ma soirée à explorer le parc de Kew et le jardin botanique.[21] Cette très modeste résidence appartient à la couronne;[22] c'était la retraite favorite de la reine Charlotte,[23] femme de Georges III. Le petit pavillon qu'habitait le couple royal, semblerait trop bourgeois à un enrichi de nos jours.[24]

Colloquial Exercise.

1. Où était l'auteur?
2. Qu'aperçut-il vers la mi-février?
3. De quoi avait-il besoin pour respirer?
4. Que résolut-il?
5. Comment lui avait-on cité Richmond?
6. Fut-il longtemps en chemin?
7. Quelle vue s'offre au voyageur du haut de la terrasse de Richmond?
8. Que voit-il se dérouler devant ses yeux?
9. Quelle apparence ont les habitations?
10. Que voit-on de distance en distance?
11. A quoi ressemblent ces pelouses?
12. Qu'y font les cerfs, les biches et les faons?
13. Que voit-on aussi de la colline de Richmond?
14. A quoi l'auteur compare-t-il la Tamise ici?
15. Qu'est-ce que la Tamise à Richmond?
16. Que ne dirait-on pas?
17. Que fit l'auteur après le déjeûner?
18. Qui habitait alors cette maison?
19. Comment cette villa est-elle située?
20. Que voit-on dans le fond?
21. Que fit l'auteur dans la soirée?
22. A qui appartient cette habitation?
23. Qu'était cette résidence?
24. Que semblerait aujourd'hui le pavillon habité par le couple royal?

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NOTES AND REFERENCES.—*a.* from *résoudre;* L. part ii., p. 104.—*b.* L. S. 97, R. 6.—*c.* L. S. 97, R. 2.—*d. faon* is pronounced as if it were written *fan.*—*e.* toile de fond, *ground.*

SECTION II.

La reine Charlotte s'en arrangeait[a] à merveille; elle y était plus heureuse qu'à Windsor.[1] Cette reine d'un esprit peu agréable, mais solide, possédait de grandes qualités;[2] elle était le modèle des épouses de la Grande-Bretagne. Les Anglais de mon âge se souviennent[b] encore des soins assidus et pleins d'égards,[3] qu'elle n'a cessé[c] de rendre à son malheureux époux pendant sa longue et cruelle maladie.

A Kew, Charlotte et Georges III. vivaient très retirés; souvent, on les voyait assis tous les deux sous les nobles ombrages des cèdres;[4] là, ils oubliaient les soucis du trône, les ennuis de la cour, et s'occupaient avec les délices de la botanique qu'il aimaient passionnément.[5]

Un jour, une jolie enfant, avec de beaux cheveux noirs bouclés,[7] passa près du banc où ils se reposaient de leur promenade. La reine appela la petite fille,[8] qu'elle trouva charmante. C'était l'enfant d'un émigré français.[9] La petite fille avait rempli son tablier, de fleurs champêtres,[1] qu'elle venait[d] de cueillir sur les pelouses. La reine lui parla d'abord en anglais.[11] L'enfant ne comprenant point cette langue, sa famille ne faisait que d'arriver en Angleterre,[12] la reine lui dit en français:

—Vous avez là de bien jolis bouquets; pour qui sont-ils?[13]

—Pour maman, qui aime bien les fleurs;[14] mais qui ne peut plus venir voir les belles plantes qu'il y a ici ... parcequ'elle est malade.

Y a-t-il longtemps[e] qu'elle souffre?[15]

Oh! oui, bien longtemps! bien longtemps![16] depuis qu'elle a appris la mort de papa, que les méchants ont tué.

—Quels méchants?[17]

—Les révolutionnaires, qui ont tué le roi.[18]

—Pauvre enfant![19] dit le roi Georges en passant sa main dans la belle chevelure de jais de la petite Français;[20] que Dieu te conserve ta mère!

—Je le demande au bon Dieu tous les jours[21] et cependant elle ne guérit pas Je voulais rester auprès d'elle aujourd'hui; mais elle a ordonné à ma bonne de m'amener ici.

Alors Charlotte se leva et pria l'enfant de la conduire à sa bonne.[22] La vieille gouvernante était loin de croire que c'était une reine, qui venait ainsi vers elle,[23] si simplement mise[c] et tenant la petite par la main.

—D'où venez-vous, Mademoiselle Louise?[24] demanda-t-elle d'un ton sévère; je vous avais recommandé[b] de ne pas vous éloigner.

—Ne la grondez pas,[25] dit la reine, elle était, la pauvre petite, à me parler de sa mère, et je viens vous demander, Madame, de me conduire chez elle.

COLLOQUIAL EXERCISE.

1. Cette retraite plaisait-elle à la reine?
2. Quelles qualités possédait Charlotte?
3. De quoi les Anglais se souviennent-ils?
4. Où voyait-on Charlotte et Georges à Kew?
5. Que faisaient-ils sous ces ombrages?
6. De quoi s'occupaient-ils?
7. Que virent-ils un jour?
8. Que fit la reine Charlotte?
9. Quelle était l'enfant?
10. De quoi la petite fille avait-elle rempli son tablier?
11. En quelle langue la reine lui parla-t-elle d'abord?
12. Pourquoi la petite ne la comprenait-elle pas?
13. Que lui dit la reine en français?
14. Que répondit la petite fille?
15. Que demanda alors la reine?
16. Quelle fut la réponse de l'enfant?
17. Quelle question la reine fit-elle encore?
18. Comment la petite fille y répondit-elle?
19. Que dit alors le roi Georges?
20. Que faisait-il pendant qu'il parlait?
21. Que dit alors l'enfant?
22. Que fit la reine Charlotte?
23. Qu'est-ce que la gouvernante était loin de croire?
24. Que fit-elle à la petite fille?
25. Que dit Charlotte à la gouvernante?

NOTES AND REFERENCES.—*a.* L. part ii., § 49, R. (1).—*b.* L. S. 36, R. 2.—*c.* L. part ii., § 135, R. (3).—*d.* L. S. 25, R. 2.—*e.* L. S. 56, R. 2.—*f.* que, *may.*—*g.* mise, *dressed.*—*h.* L. S. 41, R. 9.

CHRONOLOGY.—No. VI.

A.D.
410.—Alaric a third time before Rome, which he storms and plunders.
420.—The kingdom of France begins upon the Lower Rhine under Pharamond.
426.—The Romans, reduced to extremities at home, withdraw their troops from Britain and never return; advising the Britons to arm in their own defence and trust to their own valour.
440.—The Picts and Scots harass the unhappy Britons, who suffer severely from their incursions.
446.—The Britons in vain appeal for help to the Romans.
447.—Attila (surnamed the scourge of God), with the Huns, ravages the Roman Empire.
449.—Vortigern, King of the Britons, invites the Saxons into Britain to repel the Scots and Picts.
451.—Attila plunders Upper Italy.
455.—The Saxons, having repulsed the Picts and Scots, invite more of their countrymen, and begin to establish themselves in Kent under Hengist.
476.—FALL OF THE WESTERN EMPIRE.
477.—The Eastern Goths acknowledge the authority of Theodoric, the Emperor.
481.—Clovis made king of the Franks.
484.—Christians persecuted by the Vandals in Africa.
490.—Italy invaded by the Eastern Goths.
496.—Christianity established in France.
502.—Burgundians defeated and made tributaries of France.
507.—Prince Arthur reigns in England.
510.—Paris made the capital of France.
511.—Clovis, King of France, dies, and is succeeded by his four sons.
514.—Constantinople besieged by the Goths.
516.—Use of the Christian Era—Anno Domini (year of our Lord)—introduced.
522.—Seville made the capital of Gothic Spain.
527.—Accession of Justinian as Emperor of the East.
529.—Justinian Code issued.
533.—Belisarius wrests Africa from the Vandals.
535.— " regains possession of Sicily.
536.— " recovers Rome.
537.— " re-takes Naples.
538.— " defeats the Goths.
546.— " recovers Rome from Totila.
559.— " routes the Bulgarians at Constantinople.
562.— " falls into disgrace.
565.—Death of Belisarius.
568.—Lombard kingdom established.
569.—Mohammed born.
596.—Mission of Augustine to preach the Gospel to the Anglo-Saxons.
598.—Augustine appointed Archbishop of Canterbury, and Christianity established in England.
616.—Ethelbert publishes his Code of Saxon Laws.
632.—Mohammed conquers Arabia, and lays the foundation of the Saracen Empire.
637.—Jerusalem captured by the Saracens.
640.—Alexandria taken, and its famous library burnt by the Saracen, Khalif Omar.
647.—The Saracens, under Abdallah, invade Africa.
648.—Cyprus captured by the Saracens.
651.—Persia conquered by the Saracens.
663.—Pope Vitalian orders that divine service shall be celebrated only in Latin.
668.—The Saracens invest the city of Constantinople. Grand Cairo founded.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXIV.

(*Continued from page* 104.)

MAGNETIC EFFECTS—GALVANOMETER.

Electro-Dynamical Attraction and Repulsion.—We owe our knowledge of this interesting subject almost entirely to the ingenious and fertile investigations of M. Ampère and Mr. Faraday. It constitutes by far the most important portion of electro-dynamics, by reason of the fact, that it is the bond of connexion between electricity and magnetism, and the foundation of the mathematical theory which embraces and accounts for all the known phenomena of electro-magnetism. These phenomena, like those of ordinary electricity, are so numerous, and susceptible of such infinitely varied modifications and combinations, that a theory is not only useful, but necessary. Indeed, we may here remark in general, that when the facts which constitute any branch of physical science become so numerous that it is difficult, if not impossible, to remember them independently, a theory, by serving to connect them, is useful as an artificial means of memory. And when that theory is capable, not only of generalising known facts, but also of leading to the discovery of new truths, by suggesting experiments and truths of exact reasoning, it becomes an important auxiliary to experimental philosophy. We should not, however, fall into the error of mistaking the scaffolding for the edifice to be erected; and, still less, treat with contempt all such artificial aids, as is the habit of some, who not unfrequently confound together the known and unknown, and speak of the electrical and magnetic fluids as realities, instead of as mere hypotheses to connect isolated facts.

The first discovery in electro-dynamics which served to draw particular attention to the subject was made in 1819, by Professor Œrsted of Copenhagen, who found that a magnetic needle acted upon by a galvanic current assumes a position at right angles to the direction of the current. Other new and important facts were promptly discovered by Ampère, Arago, Sir Humphry Davy, Faraday, and others; and all the observed phenomena were satisfactorily referred by Ampère to the laws which govern the mutual action of electrical currents, by means of the ingenious hypothesis, that magnetism consists in electrical currents revolving round the molecules of a magnet, in planes perpendicular to its axis.

The laws of electro-dynamical attraction and repulsion, experimentally established by M. Ampère, and which serve to explain all known phenomena, may be succinctly stated in a few general propositions.

Prop. 1. Parallel currents flowing in the same direction attract each other; and they mutually repel when their directions are opposite.

Prop. 2. Two currents attract each other when they both flow towards or from a point—or the line of shortest distance between them—if they are not in the same plane; and they repel each other, if one approaches and the other recedes from it.

Prop. 3. The forces vary in intensity in the inverse ratio of the square of the distance. And the action of a current flowing in a given direction is, in all cases, equal and contrary to that which it exerts when it passes in the opposite direction, the current acted upon and the distance remaining constant.

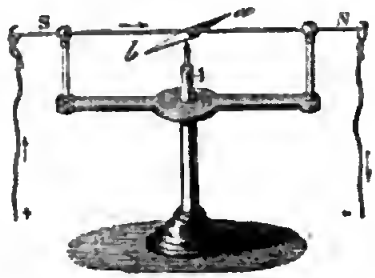
Prop. 4. The attraction or repulsion exerted by a current passing through a tortuous conductor, however numerous its flexures, is exactly equal to that which is produced by the same current when it flows in a straight line between the same points.

To deduce from Ampère's theory the phenomena of magnetic attraction and repulsion, it becomes necessary first to ascertain the direction, which the above laws of electro-dynamical action require us to assume to be that of currents supposed to revolve round the axes of the magnets. And it has been found that to render the theory accordant with observed facts, the motion of the hypothetical currents must be *contrary to* the apparent daily motion of the sun, or to that of the hands of a watch, when the north pole of the magnet is elevated.

All the effects produced by the mutual action of electrical currents and magnets flow from this theory, as consequences of the above principles of electro dynamical attraction and repulsion. Thus the fact discovered by Œrsted, that a magnet assumes a polar position transverse to that of an electrical current, or tangential to circles described about the latter as an axis, is a simple instance of the tendency of currents to assume parallel and similar directions.

Œrsted's Experiment.—The discovery made by Œrsted, is the directive action exerted by a fixed current at a distance upon a moveable magnetised needle. To make this experiment, stretch a copper wire horizontally in the direction of the magnetic meridian above a moveable magnetised needle, as fig. 432 represents. As long as the wire is not traversed

Fig. 432.



by the current, the needle remains parallel, but directly the ends of the wire are put in communication with the electrodes of a pile or battery, *the needle is deflected, and becomes more and more nearly perpendicular to the current as the latter increases in intensity.*

With regard to the direction in which the poles are deflected, there are several cases, which may be reduced to a single principle. Before doing this, we will recall the convention already stated, with regard to the cause of the current, that it is conceived as always going from the positive to the negative pole along the wire. Bearing this in mind, the preceding experiment presents the four following cases.

1. If the current passes above the needle and goes from south to north, the south pole is deflected towards the west. It is this position that is represented in the figure. 2. If the current passes below the needle still from south to north, the south pole is deflected to the east. 3. When the current passes above the needle in the direction from the north to the south, the south pole turns towards the east. 4. Lastly, the deflection is towards the west when the current goes from north to south below the needle.

If we conceive, as Ampère did, an observer placed in the wire in such a way that the current, entering at his feet, goes out at his head, and his face is constantly turned towards the needle, we shall easily see that in the four cases just mentioned the south pole is deflected towards the left of the observer. The current being thus personified, as it were, we may include the above four cases in the enunciation of the following general principle.

In the directive action of currents upon magnets, the south pole is constantly deflected towards the left of the current.

It was in the month of July, 1820, that Œrsted made known his celebrated discovery, and in the succeeding September, M. Arago communicated to the Academy of Sciences at Paris the second electro-magnetic discovery, that a galvanic current possesses the power of rendering iron or steel magnetic.

It therefore appears, that the power of electrical currents to induce other currents and develop magnetism, required for the verification of Ampère's theory, is found by experiment to be a physical fact.

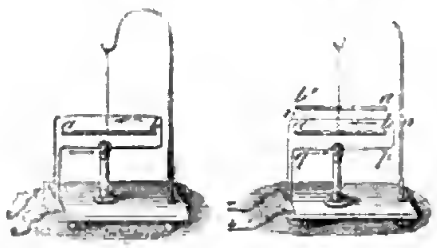
The established principles of electro-dynamical attraction and repulsion, combined with Ampère's theory, not only furnish a ready explanation of every electro-magnetic machine which has been or may be invented, but also enable any one to foresee the result of new combinations, and therefore to contrive without difficulty an unlimited number of arrangements for the purposes of illustration. When the nature and laws of physical forces are once determined, it is the office of mere mechanical ingenuity to apply those forces; but little credit, therefore, can be any longer claimed for the invention of an electro-dynamical toy.

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Galvanometer, Electro-Magnetic Multiplier.—It is evident that, if a number of similar currents act in like manner upon a given current or magnet, the sum of the forces which they exert will be directly proportional to their number. It also appears from the four principles stated above, that any two currents flowing in opposite directions should act alike upon a magnet placed between them. Upon these principles the *electro-magnetic multiplier*, or *galvanometer*, of Schweigger, a German philosopher, is constructed. It is an extremely delicate apparatus, serving to show the existence, direction and intensity of currents. It was invented by Schweigger shortly after the discovery of Œrsted.

To understand the principle of it, let us consider the case of a magnetised needle suspended by a silk untwisted thread, fig. 433, and surrounded, in the plane of the magnetic meridian, with

Fig. 433. Fig. 434.



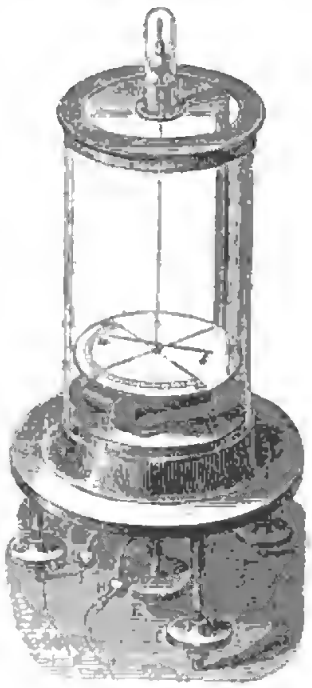
a copper wire forming a complete circuit round the needle in the direction of its length. When a current passes along this wire, it follows, from the convention which we have already stated, that in every part of the circuit an observer lying along the wire in the direction of the arrows, and looking at the needle *a b*, would have his left turned towards the same point of the horizon, and, consequently, that the action of the current everywhere tends to deflect the needle in the same direction. In other words, the actions of the four branches of the circuit contribute to deflect the south pole in the same direction; therefore, by winding the wire round the needle as the figure represents, we have *multiplied* the action of the current. If, instead of a single circuit, we have several, the action is multiplied still further, and the deflection of the needle is increased still more. However, we should not multiply the action of the current indefinitely by continuing the circumvolutions of the wire, for we shall soon see that the intensity of a current becomes feeble when the length of the circuit through which it passes increases.

As the directive influence of the earth tends incessantly to keep the needle in the magnetic meridian, and thus opposes the action of the current, the effect of the latter may be rendered more perceptible by making use of a system of two astatic needles, as seen in fig. 434. The action of the earth upon the needles is then very feeble, and besides the actions of the current on the two needles are added together. In fact, the action of the complete circuit tends, according to the direction of the current marked by the arrows, to deflect the south pole of the inner needle *a b* towards the west. With regard to the upper needle *a' b'*, it is subject to the action of two contrary currents *m n* and *p q*, but the former being nearer, its action prevails over the other. Now this current passing below the needle from the south to the north pole, evidently tends to deflect the pole *a'* towards the east, and consequently the pole *b'* towards the west, that is to say, in the same direction as the pole *a* of the other needle.

These principles having been premised, it is easy to explain the theory of the *multiplier*. This apparatus, represented in fig. 435, is composed of a cylindrical copper case, round which is rolled a copper wire covered with silk along its whole length, to isolate the circuits from one another. Above this case is a horizontal dial-plate graduated, the zero point of which corresponds to the diameter parallel to the direction of the copper wire upon the dial. This dial has two graduations, the one on the right of the zero point, and the other on the left, but only as far as 90 degrees. By means of a support and an extremely fine silk fibre, an astatic system is suspended, consisting of two sewing needles *a b* and A, the former above the dial, and the latter within the circuit. These needles, which are connected together by means of a copper wire, like those in fig. 371, p. 49, and cannot be deflected separately, or one without the other, cannot have exactly the same magnetic intensity unless every current, whether strong or feeble, renders them always transverse to itself.

The bent branches K and H which are connected, below the apparatus, with the two ends of the circuit, are intended to receive the conductors which transmit the current that we wish to observe. The foot screws C, serve to place the apparatus in a perfectly vertical position, so that the suspended thread corresponds exactly to the centre of the dial. Lastly, a button E transmits the motion to the plate D and the dial—both of which are moveable about a vertical axis, in such a manner as to bring the wires of the circuit in the direction of the mag-

Fig. 435.



netic meridian without displacing the apparatus. The galvanometer represented in our illustration is the work of M. Billant, an ingenious manufacturer of such articles.

When the galvanometer is intended for observing currents arising from chemical action, the wire of the circuit, as we shall soon see, ought to be of a small diameter, and to make from four hundred to six hundred revolutions, or even more. On the contrary, for thermo-electrical currents, of which we shall speak on a future occasion, the wire ought to be of large diameter, and to make a much smaller number of revolutions.

Thus constructed, the galvanometer gives no indication of any current when we pass the electricity of an electrical machine along the wire, by connecting one of the ends with the conductors and the other with the earth. We can only render the current which then passes along in the apparatus perceptible, by making use of a very fine wire coiled round two or three thousand times, and by completely isolating the circuits from one another by means of silk, varnish and gum lac. If these conditions are observed, the needles will be deflected by the electricity of an electrical machine, which shows the identity of statical and dynamical electricity.

Graduation of the Galvanometer.—The galvanometer which we have just described is an extremely delicate apparatus for establishing the fact of the presence of currents, but it does not make known their intensity. To make it serve this purpose, it is necessary to construct tables, by means of which the intensity of the current may be deduced from the deflection of the needle.

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The simplest method of forming these tables is that of *the double wire multiplier*. Coil two copper wires at the same time round the apparatus, each being covered with silk, and both of the same length and diameter. Then selecting a constant, but very feeble, source of dynamical electricity, pass the current along one of the wires, thus causing a certain deflection, say of five degrees. Then by means of an electric source identical with the above, pass a current of the same intensity along both wires at the same time, thus obtaining a deflection of ten degrees, owing to the simultaneous action of the two currents, or—which is the same thing—to a current of twice the intensity of the first. If you then pass along one of the wires a current capable of producing by itself a deflection of ten degrees, and along the other one of the currents which gave a deflection of five degrees—which is evidently the same thing as tripling the first current—you will obtain a deflection of fifteen degrees. Lastly, by passing along each of the wires at the same time a current capable of producing a deflection of ten degrees, you may get a deflection of twenty degrees. In other words, *up to twenty degrees the deflections increase in proportion to the intensity of the current*. Beyond that point they increase less rapidly; but by the same process you may gradually determine from point to point the deflections which correspond to known intensities, and complete the table by the method of interpolations. Each galvanometer requires a table of its own, because the relation between the intensity of the current and the deflection of the needle varies with the degree in which the needle is magnetised, its length, its distance from the current, and lastly, with the extent of the circuit.

The double wire multiplier may also serve to establish the difference of the intensities of two currents. This is effected by passing a current along each wire at the same time, but in contrary directions. The apparatus then bears the name of the *differential galvanometer*.

Uses of the Galvanometer.—The galvanometer, on account of its extreme sensibility, is one of the most valuable philosophical instruments. It serves not only to establish the fact of the presence of the feeblest currents, but to make known their direction and intensity. It was by means of this apparatus that M. Becquerel was able to prove that a disengagement of electricity accompanies all chemical combinations, and to determine the laws which regulate these combinations.

For example, if you fasten two platinum wires to the extremities of the circuit of the galvanometer, and plunge them into a small vessel containing nitric acid, you discover no deflection of the needle, as might have been easily foreseen, because the platinum is not acted upon by nitric acid. But if you pour a drop of hydro-chloric, chloro-hydric, or muriatic acid, near one of the submerged wires, the needle of the galvanometer is immediately deflected, which proves that there is a current in the circuit. In fact, we know that nitric and chloro-hydric acid by their mutual reaction produce chloro-nitric acid, which acts upon platinum. We gather also from the direction of the deflection, that the platinum is electrised negatively and the acid positively.

LESSONS IN GEOLOGY.—No. LVIII.

By Thos. W. Jenkyn, D.D., F.R.G.S., F.G.S., etc.

CHAPTER V.

ON THE CLASSIFICATION OF ROCKS.

SECTION XI.

ON THE COAL FORMATION.

§ 1. THE LITHOLOGICAL CHARACTER OF THE COAL ROCKS.

The rocks which embrace in one group mineral coal, iron ore and limestone, are the most important in the whole world. By opening up sources of industry and wealth, and by calling forth the energy and skill of a people, the carboniferous rocks tend to confer upon a country far greater power than it could derive from veins of silver or valleys of gold dust. Coal, iron and limestone have made England what it is.

The whole series of rocks which contain sand rocks, clay shales, seams of coal, beds of grits and bands of limestone, take their name from the coal only, and are therefore called the carboniferous system. This is somewhat remarkable, and must be taken as an indication of the great worth of coal, for if all the seams of coal found in the group were measured, their united thickness would not be 100 feet, while the depth of the entire series, from the bottom of the Permian to the upper surface of the Old Red Sandstone, is more than twelve thousand feet.

The series of rocks which contain coal are divided into three classes.

I. The Coal Measures.
II. The Millstone Grit.
III. The Mountain Limestone.

1. THE COAL MEASURES.

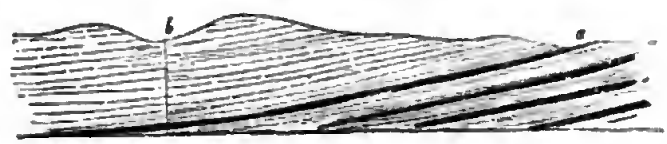
1. The rocks which are specially called Coal Measures, consist of deep beds of gritty sandstones, layers of soft and pitchy clays called, on account of their being laminated, shales, seams of coal in an almost crystalline state, bands of clay rocks containing iron-stone, and alternating with sand rocks. The uppermost beds of the coal measures generally consist of gritty stones which give very little indication of coal. These grits are sometimes three thousand feet thick, are for the most part destitute of fossils, and are generally called "the upper coal grits." They are represented in fig. 14.

2. Coal is a pitchy mass of vegetable matter mineralised. The vegetable matter is the decomposed remains of cone-bearing trees, gigantic ferns and club mosses, with sometimes the branches, and even the bodies, of entire trees of immense size. The coal beds are found in seams, separated from each other by layers of clayey shales, beds of hardened clay and thick masses of sand rock. The position of the seams of coal in what are called Coal Basins is represented in the accompanying engraving, fig. 15.

3. Every seam of coal has an under-bed of sandy shale and a roof of slaty clay, or clay shale.

The Floor, or the bed on which a seam rests, is called the *underclay*, which is always co-extensive with every seam of coal. It consists of a sandy or gritty shale, which is sometimes called firestone, or rather *fire-clay*, on account of its

Fig. 14. *The Upper Grits of the Coal Measures.*

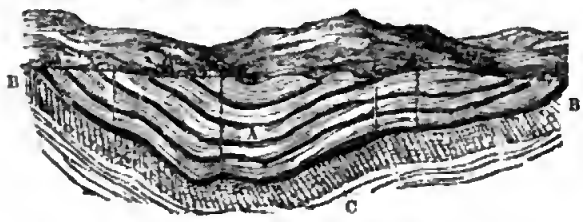


a. Entrance into the Coal by adit or level. *b. Entrance through the Grits by a shaft.*

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capacity to be formed into bricks, which will stand the fiercest heat of the furnaces. These beds of underclay vary in thickness from a few inches to more than ten feet. Sometimes they are but very slightly coloured with coal matter, at others

Fig. 15. An Ideal Section of a Basin of Coal Measures.



A. *Seams of coal, shale, and sandstone.*
B. *The millstone grit.*
C. *The mountain limestone.*

they are completely blackened with it. Though this underclay always forms a floor for the coal seams, yet there are occasionally bands of it without any coal at all. When a mass of this tough band are exposed to the atmosphere they become a gray friable earth.

This underclay bed contains, almost invariably, an abundance of the fossil vegetable termed *Stigmaria*, which were once supposed to be aquatic plants, but are now found to be the roots of some of the plants, whose decomposition and mineralisation formed the seams of coal.

The Roof of the coal seams is generally a slaty clay called shale. It seems to consist of the waterworn detritus of other rocks. It abounds with the leaves, branches and fruits of plants. It contains also layers and nodules of ironstone, which enclose leaves, insects and the remains of animals allied to the crab.

In some places, its beds contain fresh-water shells, and in others, sea shells, and these beds are interstratified with pitchy shales and fine slaty clays, micacious sands, and grits and pebbles of limestone and sandstone.

Hence you learn, *First*, that the *underclay* was the natural soil in which the *Stigmaria*, the roots of the coal forest, grew. *Secondly*, that the coal is the foliage, branches and trunks of such forest, decomposed during millenniums of ages, and then mineralised. *Thirdly*, that the Roof or the shaly stratum was formed by the detritus worn from other rocks, and either transported by a flood, or brought by the sea after a submergence that overwhelmed the decomposed forest.

4. The decomposed vegetable matter which forms coal is capable of various modifications.

First. Peat. When vegetable matter is exposed to a certain amount of moisture, combined with a certain degree of temperature, it rots, decomposes, and forms peat, which is digged for fuel from swamps and bogs in mountainous districts.

Secondly. Lignite.—Lignite seems nothing but a bed of Peat that has been buried for ages under the soil of the earth, where it has undergone those chemical changes which produce bitumen or pitch. Fragments of it generally show the vegetable structure of the mass, on which account it is called lignite, or wood-coal, and sometimes brown-coal. The most perfect specimen of it is the Jet. Lignite is chiefly found in the tertiary beds, and sometimes in the higher divisions of the secondary rocks, but never in the true coal measures.

Thirdly. Pitchy or Bituminous Coal.—Pitch coal consists of the same vegetable or woody matter as lignite, and differs from it only by having been buried in the earth a longer time, during which it has undergone different and greater chemical modifications, by which it has been mineralised.

This is sometimes called "Black Coal," to distinguish it from the lignite, or brown coal. It is more or less combined with earthy particles, which accordingly, after burning, yield a proportionable quantity of ashes or cinder. The more earthy bands of coal are most generally employed in making gas, and the remains of such coal, after its distillation, form the mass called coke.

Fourthly. Anthracite.—Anthracite coal is called, on account of its compactness, "Stone Coal," and on account of its brilliant hues, "Glance Coal." It consists, like pitch coal, of carbonised vegetable matter—occasionally in the proportion of ninety per cent.—and also of a small proportion of earthy matter. It burns without either luminous flame or dense smoke. Anthracite is only common or black coal that lies in deeper seams in the earth, and that by its contiguity to some heated volcanic rocks has lost its pitch.

Culm, is coal lying nearer to volcanic rocks than Anthracite coal—so near as not only to be charred by the heat, but also crushed and shivered by the pressure.

Sixthly. Steam Coal.—Coal used to be divided into the bituminous and the anthracite, but lately a third kind has been discovered in the neighbourhood of Swansea, South Wales, an intermediate one called "Steam Coal," on account of its peculiar fitness for the engines of steam-packets. It is extremely compact, and hard, burns without any visible smoke, and contains so little pitch as not in the least to be liable to spontaneous combustion.

Seventhly. Blacklead.—Blacklead is more properly called Plumbago or Graphite. It ought never to have been called blacklead, for though in drawing pencils, etc., it marks like *lead*, it has not a particle of lead in its composition.

Plumbago is coal that has undergone more chemical changes than culm or anthracite, by which processes it has become more mineralised. In many instances, when coal is found contiguous to igneous rocks, it is converted into Plumbago, or Graphite, a name derived from the Greek γραφω, grapho, to write.

The manner, in which graphite is formed from coal may be in some measure understood from the following statement of the different relations of gases. Hydrogen is the most abundant in *fluid* pitch, and pitch and carbon abound in coal. In anthracite the pitch is wanting; but in graphite both the pitch and the hydrogen are absent, and nothing but the carbon remains.

Eighthly. The Diamond.—At present the real origin of the diamond is involved in great obscurity, but the prevalent opinion is that it is of vegetable origin. It forms the hardest substance known to chemists. It seems to be but pure vegetable matter perfectly carbonised, or pure mineral carbon crystallised. Diamonds are generally found in the detritus of beds that have been contiguous to igneous rocks, but they are beds that are associated with the carboniferous system. Thus, at Bundel Kund in India, the diamond is found imbedded in the New Red Sandstone; for 400 feet of that rock underlay the lowest diamond beds, and beneath this rock are clear indications of coal measures. That diamond is pure coal is evident from the fact that its combustion produces the same results and yields the same elementary residuum as charcoal. Liebig, however, thinks that diamonds owe their origin, not to fire, but to decay, and that they have been formed in the humid way, that is, as pure carbon in a liquid state.

II. THE MILLSTONE GRIT.

1. Beneath the sandstones, coal seams and shales of the coal measures, are thick strata of sandstones more or less compact, called the Millstone Grit. There are, however, some coal districts in which this stratum is absent, in others it appears as a cherty and sandy rock. Out of England this grit-rock is generally absent.

2. The most characteristic bed of the millstone grit is the quartzy conglomerate, which consists of rolled fragments and pebbles of quartz, limestone, and granite, of various sizes, from a pea to a good-sized apple, all of which are cemented together by a clayey paste, or, in some instances, by a flinty paste. Such a piece, when looked at a hand specimen, has the following appearance, fig. 16.

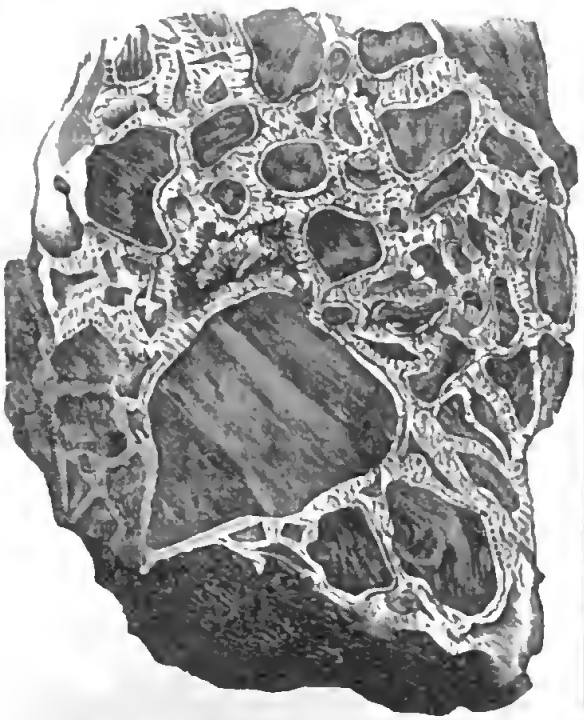
Fragments of these beds appear sometimes in large masses, some of which are dressed and tooled into millstones, from which the rock derives its name of millstone grit.

3. There are also associated with this grit beds of sandstone composed of the fine detritus of other and older sandstone rocks. In such beds of sandstone are found water-worn fragments of shale, red sandstone, and even stems of plants, all of which bear the marks of having been transported and deposited by currents.

4. As to the real position of this rock in the carboniferous system, the general rule is that it is under the coal measures; but yet, in some coal fields, the seams of coal are found inter-

stratified in the beds of this grit. In other districts the lowest beds of the millstone grit, instead of being gritty, consist of shale containing coal plants and nodules of iron ore, just like the shales which we have described as forming the roof of the coal in other places. When shales appear in this composition, they have often satin spar, naphtha, petroleum and other substances of a pitchy character. There are also instances in which the lower beds of the millstone grit have veins of lead and copper ore.

Fig. 16. A small Fragment of Conglomerated Millstone Grit, tooled on the surface.



5. In parts of Derbyshire and Yorkshire the high ridges of the mountain limestone are capped by thick beds of millstone grit. In these cases the lower portions of the grit are sometimes represented by a series of laminated clays or pitchy shales, which rest immediately on the limestone. These shales contain some bands of iron-stone, and are interstratified with fine thin block limestone. The upper part of this grit, that which forms the surface of the ridges, consists of beds, many hundred feet thick, of pebbly grits and other sandy rocks, which alternate with thin seams of bad coal.

III. THE MOUNTAIN LIMESTONE.

The Mountain Limestone has been sometimes called "the carboniferous;" but this designation is not truly descriptive of it, because in no district but in the Berwickshire coal-field do these limestone beds bear or contain coal.

1. This limestone goes by different names. On account of its abounding occasionally with ores of lead and other metals, it has been called "metalliferous limestone." As in some districts it abounds with the remains of fossil lilies or encrinites, it has been called "encrinal or encrinital limestone." Because it sometimes forms elevated chains of hills, as at Matlock, in Derbyshire; St. Vincent's Rocks, near Bristol; Taff Vale, between Brecon and Merthyr Tydfil, in South Wales, it is called the mountain limestone. Even this is not an invariable feature of this rock, for in Ireland and on the continent it is most frequently found in valleys.

2. The mountain limestone is the basis of the coal formation, as it lies between the coal beds and the more ancient rocks, the old red sandstone—or where this group is absent, the Silurians. In the south-western extremity of England an imperfect coal measure called culm takes the place of the mountain limestone, and lies between the millstone grit and the old red sandstone.

These calcareous beds are composed, for the most part, of subcrystalline gray limestones, in beds of considerable thickness, nearly three hundred feet, and separated only by very thin partings of clay. The stone is capable of very high polish, and forms beautiful marble. It is supposed to have been originally a coral reef, for it abounds with bands of shells and encrinital remains, and also with fragments of fishes.

Some of its beds are indeed destitute of fossils, but the rock itself is, for the most part, made up of the remains of coral, shells, encrinites, etc., which often form three-fourths of the mass, as may be seen in the different marbles, especially those of Derbyshire.

3. This group of limestone is remarkable for the variety of substances found in it. In some districts it is interstratified with shales, and grits, and amygdaloidal rocks, or volcanic rocks which have cells in them, and which cells are filled with a different substance. In other districts these limestone beds have in them layers and nodules of chert, just as beds of chalk have those of flints.

These rocks are also distinguished for their spars. The fluor spar, which is the celebrated Derbyshire spar, is a fluate of lime; and it occurs among these limestones both in crystals and nodules. The blue John spar is very celebrated, as the best material for making vases and other ornaments. This is found to occur both as veins and also as large and irregular masses.

4. Most of the caverns of the earth occur in this limestone. Wherever it occurs it abounds in deep chasms and fissures, by which it is traversed in all directions, and also in deep subterranean caverns like those of Somersetshire, Derbyshire, and Yorkshire.

In the north-western parts of Yorkshire the mountain limestone is one thousand eight hundred feet thick, and may be divided into two groups. The upper forms the Yoredale Rocks, and the lower is what is called the Scar Limestone. Both of these abound in large natural caverns. Though these two groups of limestone are true mountain limestone, they differ from the mountain limestone of the south of England, by having occasionally thin layers of coal among them, and by being divided into several thin beds by partitions of grit and shale.

5. Many lead mines have been opened in the mountain limestone, especially in the counties of Somerset, Derby, York, Durham and Northumberland. The metal occurs generally in veins. Sometimes chasms or hollows of many hundred feet wide in the rock are found to contain metallic ores and spars. Manganese, copper, zinc and iron are found in this limestone; but the predominating metal is galena, or the sulphuret of lead, which occurs often in cubes and in eight-sided crystals. The same ore is found also in thin layers and in veins, frequently accompanied with fluor spar, lime spar, barytes [bár-ry-tes] and iron pyrites.

BIOGRAPHY.—No. XVI.

THOMSON.

By J. R. Beard, D.D.

It is possible to be a poet of nature without being a natural poet. To some extent the fact finds illustration in Thomson, whose poetry, with all its attractions, wants simplicity and true sentiment. James Thomson was born on the 11th of September, 1700, at Ednam, near Kelso, in Roxburghshire. His father was minister at that place at the time of James's birth, but removed to Southdean, as the income there was less insufficient for the wants of a family of nine children. The young Thomson soon manifested tokens of poetic talent, and his mother, a woman of a tender heart, encouraged the propensity. In Edinburgh, whither he had gone in order to continue his studies, he did not distinguish himself beyond other students. Nay, under the impulse of a natural call to the poetic office, he seems to have undervalued learned pur-

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suits. However, in compliance with the wishes of his friends, he applied to theological studies. When under examination for the pulpit he was required to expound one of the Psalms. The stiff and rigid Scotch theologian pronounced the version too poetical. The condemnation engendered in Thomson so great an aversion to theology, that from that moment he resolved to devote himself to the art for which he felt nature had created him. At the time there existed in the University a Belles Lettres Club, which called itself "The Athenian Society." This society published a collection of poetry under the title of "The Edinburgh Miscellany." To this work Thomson appears to have contributed, though his pieces have not been identified. Convinced that his talents could find due recognition only in London, and in the hope of obtaining some assistance from a family known to him that lived there, he betook himself to the metropolis in the autumn of 1725. In London, among other of his college mates, he found David Mallet, who filled the post of tutor to a son of the Duke of Montrose. To him he showed his "Winter," which then consisted simply of fragments. At Mallet's suggestion he finished and published the poem. It appeared in 1726, and had a favourable reception. It is still accounted Thomson's master-piece. The dedication of the poem to Sir Spencer Compton procured the author only twenty guineas. A larger reward, however, he found in the reputation it brought him. Among other advantages it gained him an acquaintance with Pope. In 1727 he published his "Summer," dedicated to Lord Melcombe. In the same year he put forth a "Poem Sacred to the Memory of Sir Isaac Newton," and another under the title of "Britannia," being an invective against the government. Next appeared (1728) "Spring," with a dedication to the Countess of Hertford, afterwards Duchess of Somerset. This compliment brought him an invitation to Lord Hertford's mansion, where he remained some months.

The "Autumn" did not appear until our poet published an edition of his works in 1730. The same year Thomson placed on the stage his tragedy of "Sophonisba." Having been read in private circles, the play had excited great expectations. Disappointment ensued. The line

"Oh, Sophonisba! Sophonisba, oh!"

was parodied thus,

"Oh, Jemmy Thomson! Jemmy Thomson, oh!"

Not long after, the poet accompanied Charles Talbot, eldest son of the Lord Chancellor, in a tour on the continent, whence he returned home enriched with varied knowledge. He was rewarded for his care of the young man with an office, which secured him an income without requiring much of his time. While on his travels he formed the first idea of his poem on "Liberty," to the composition of which he devoted two years. During the time his pupil died. The loss occasioned the dedication to the young man's memory of a few lines at the commencement. Thomson set a great value on this production, and expected it would secure unusual acceptance. The hope was but partially fulfilled. It consists of five books or cantos, having these titles: 1, Ancient and Modern Italy compared, 2. Greece, 3. Rome, 4. Britain, 5. The Prospect. A short time after its publication his patron died, and Thomson lost his place. In consequence he was thrown on literature as a source of support. In 1738 his tragedy of "Agamemnon" was submitted to the public in Drury-lane Theatre. It obtained no very marked success. About this time Thomson became acquainted with the Prince of Wales, who, affecting popularity, had become a patron of poets and scholars. He gave our poet a pension of £100. In 1731 the prince desired that Thomson's tragedy, "Edward and Elenora," should be played, but the Lord Chamberlain forbad the representation, because the author was of the party in opposition to the Court. In 1740 Thomson, in union with Mallet, produced "The Masque of Alfred," a piece which was represented in honour of the Princess Augusta on her birthday. In 1745 his tragedy of "Tancred and Sigismunda" was exhibited, and won greater popularity than any other of his plays. The last of his publications, and perhaps the loveliest, his "Castle of Indolence," appeared in 1746. About this time Thomson, through the influence of his friend Mr. Lyttleton, obtained the post of "Surveyor of the Leeward Islands," a strange office for a poet; but the unsuitableness was compensated for by an income of £300 a-year. He might now have lived at his ease, but a cold which he took soon ended his days (Aug. 27th, 1748). A tragedy, named "Coriolanus," was published after his decease.

Among Thomson's works, "The Seasons" may be pronounced the best. Thomson drew his pictures immediately from nature. Hence their truth, their lively colouring and their varied beauty. He says of himself in his "Autumn,"

"I solitary court
Th' inspiring breeze, and meditate the book
Of Nature, ever open; aiming thence
Warm from the heart to pour the moral song."

In his dramatic works you recognise the author of "The Seasons," but his works of that class lack the concentrated thought and rapid action essential to perfection. His poem on "Liberty" has some fine passages, yet, as a whole, must be pronounced heavy. More attractive is "The Castle of Indolence."

"The Seasons" have been often printed apart from the rest.

Thomson's collected works appeared first in 1730. See also "Essays on the Life and Writings of Saltoun and the poet Thomson, by the Earl of Buchan," London 1792; Aikin's "Essay on the Plan and Character of Thomson's Seasons;" Lives of the poet by Johnson, Anderson, Nicola, etc. We present as specimens of this poet passages from

A PANEGYRIC ON GREAT BRITAIN.

Heavens! what a goodly prospect spreads around,
Of hills, and dales, and woods, and lawns, and spires,
And glittering towns, and gliding streams, till all
The stretching landscape into smoke decays!
Happy Britannia! Where, the queen of arts,
Inspiring vigour, Liberty abroad
Walks unconfined, even to thy farthest cots,
And scatters plenty with unsparing hand.
Rich is thy soil, and merciful thy clime;
Thy streams unfailing in the summer's drought:
Unmatch'd thy guardian-oaks; thy valleys float
With golden waves; and on thy mountains flocks
Bleat numberless; while, roving round their sides,
Bellow the blackening herds in lusty droves
Beneath thy meadows glow, and rise unquell'd
Against the mower's scythe. On every hand
Thy villas shine. Thy country teems with wealth;
And property assures it to the swain,
Pleased, and unwearied, in his guarded toil.
Full are thy cities with the sons of art;
And trade with joy, in every busy street,
Mingling are heard; even Drudgery himself,
As at the car he sweats, or dusty hews
The palace-stone, looks gay. Thy crowded ports,
Where rising masts on endless prospect yield,
With labour burn and echo to the shouts
Of hurried sailor, as he hearty waves
His last adieu, and, loosening every sheet,
Resigns the spreading vessel to the wind.
Bold, firm, and graceful, are thy generous youth;
By hardship sinew'd and by danger fired,
Scattering the nations where they go; and first
Or on the listed plain, or stormy seas.
Mild are thy glories too, as o'er the plans
Of thriving peace thy thoughtful sires preside;
In genius, and substantial learning high;
For every virtue, every worth renown'd,
Sincere, plain-hearted, hospitable, kind;
Yet like the muttering thunder, when provoked;
The dread of tyrants, and the sole resource
Of those that under grim oppression groan.
Thy sons of glory many! Alfred thine,
In whom the splendour of heroic war,
And more heroic peace, when govern'd well,
Combine; whose hallow'd name the virtues saint,
And his own muses love; the best of kings!
With him thy Edwards and thy Henrys shine,
Names dear to fame; the first who deep impress'd
On haughty Gaul the terror of thy arms,
That awes her genius still. In statesmen thou,
And patriots, fertile. Thine a steady More,
Who, with a generous, though mistaken zeal,

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Withstood a brutal tyrant's lustful rage,
Like Cato firm, like Aristides just,
Like rigid Cincinnatus nobly poor,
A dauntless soul erect, who smiled on death.
Frugal and wise, a Walsingham is thine;
A Drake who made thee mistress of the deep,
And bore thy name in thunder round the world.
Then flamed thy spirit high; but who can speak
The numerous worthies of the maiden reign?
In Raleigh mark their every glory mix'd,
Raleigh, the scourge of Spain; whose breast with all
The sage, the patriot, and the hero burn'd.
May my song soften, as thy daughters I,
Britannia, hail! for beauty is their own,
The feeling heart, simplicity of life,
And elegance, and taste; the faultless form,
Shaped by the hand of harmony; the cheek,
Where the live crimson, through the native white
Soft-shooting, o'er the face diffuses bloom,
And every nameless grace; the parted lip,
Like the red rosebud moist with morning dew,
Breathing delight; and, under flowing jet,
Or sunny ringlets, or of circling brown,
The neck slight-shaded, and the swelling breast;
The look resistless, piercing to the soul,
And by the soul inform'd, when dress'd in love
She sits high-smiling in the conscious eye.
Island of bliss! amid the subject-seas,
That thunder round thy rocky coasts, set up,
At once the wonder, terror, and delight
Of distant nations; whose remotest shores
Can soon be shaken by thy naval arm;
Not to be shook thyself, but all assaults
Baffling, as thy hoar cliffs the loud sea-wave
O Thou! by whose almighty nod the scale
Of empire rises, or alternate falls,
Send forth the saving virtues round the land
In bright patrol: white Peace and social Love,
The tender-looking Charity intent
On gentle deeds, and shedding tears through smiles;
Undaunted Truth and Dignity of mind;
Courage composed and keen; sound Temperance
Healthful in heart and look; clear Chastity,
With blushes reddening as she moves along,
Disorder'd at the deep regard she draws;
Rough Industry; Activity untir'd,
With copious life inform'd, and all awake;
While in the radiant front superior shines
That first paternal virtue, public Zeal;
Who throws o'er all an equal wide survey,
And, ever musing on the common weal,
Still labours glorious with some great design.

LESSONS IN ALGEBRA.—No. XXVII.

(*Continued from page* 160.)

COMPOUND RATIO *is the ratio of the* PRODUCTS *of the corresponding terms of two or more simple ratios.*

Thus the ratio of	6 : 3, is 2
And the ratio of	12 : 4, is 3
The ratio compounded of these is	72 : 12 = 6

Here the compound ratio is obtained by multiplying together the two antecedents, and also the two consequents of the simple ratios. Hence it is equal to the product of the simple ratios.

Compound ratio is not different in its *nature* from any other ratio. The term is used to denote the origin of the ratio in particular cases.

If in a series of ratios the consequent of each preceding couplet is the antecedent of the following one, *the ratio of the first antecedent to the last consequent is equal to that which is compounded of all the intervening ratios.*

Thus, in the series of ratios $a : b$
$b : c$
$c : d$
$d : h$

the ratio of $a : h$ is equal to that which is compounded of the ratios of $a : b$, of $b : c$, of $c : d$, of $d : h$. For the compound ratio by the last article is $\frac{ab\,cd}{bc\,dh} = \frac{a}{h}$ or $a : h$.

A particular class of compound ratios is produced by multiplying a simple ratio in *itself*, or into another *equal* ratio. These are termed *duplicate*, *triplicate*, *quadruplicate*, etc., according to the number of multiplications.

A ratio compounded of *two* equal ratios, that is, the *square* of the simple ratio, is called a *duplicate* ratio.

One compounded of *three*, that is, the *cube* of the simple ratio, is called *triplicate*, etc.

In a similar manner the ratio of the *square roots* of two quantities, is called a *subduplicate* ratio; that of the *cube roots* a *subtriplicate* ratio, etc.

Thus the simple ratio of a to b is $a : b$
The duplicate ratio of a to b is $a^2 : b^2$
The triplicate ratio of a to b is $a^3 : b^3$
The subduplicate ratio of a to b is $\sqrt{a} : \sqrt{b}$
The subtriplicate ratio of a to b is $\sqrt[3]{a} : \sqrt[3]{b}$, etc.

N.B. The terms *duplicate*, *triplicate*, etc., must not be confounded with *double*, *triple*, etc.

The ratio of 6 to 2 is	$6 : 2 = 3$
Double this ratio, that is, *twice* the ratio, is	$12 : 2 = 6$
Triple the ratio, *i. e. three times* the ratio, is	$18 : 2 = 9$
The *duplicate* ratio, *i.e.* the *square* of the ratio, is	$6^2 : 2^2 = 9$
The *triplicate* ratio, *i. e.* the *cube* of the ratio, is	$6^3 : 2^3 = 27$

That quantities may have a ratio to each other, it is necessary that they should be so far of the same nature, that one can properly be said to be either equal to, or greater, or less than the other. Thus a foot has a ratio to an inch, for one is twelve times as great as the other.

From the mode of expressing *geometrical ratios* in the *form* of a *fraction*, it is obvious that the *ratio* of two quantities is the same as the *value* of a fraction whose numerator and denominator are equal to the antecedent and consequent of the given ratio. Hence,

To multiply or divide both the antecedent and consequent by the same quantity, does not alter the ratio. To multiply or divide the antecedent alone by any quantity, multiplies or divides the ratio; to multiply the consequent alone, divides the ratio; and to divide the consequent, multiplies the ratio. That is, *multiplying* and *dividing* the antecedent or consequent has the *same* effect on the *ratio*, as a similar operation, performed on the numerator or denominator, has upon the *value* of a fraction.

If to or from the terms of any couplet, two other quantities having the same ratio be added or subtracted, the sums or remainders will also have the same ratio. Thus the ratio of 12 : 3 is the same as that of 20 : 5. And the *ratio* of the *sum* of the *antecedents* $12 + 20$ to the *sum* of the *consequents* $3 + 5$, is the same as the ratio of either couplet. That is,

$$12 + 20 : 3 + 5 :: 12 : 3 = 20 : 5, \text{ or } \frac{12+20}{3+5} = \frac{12}{3} = \frac{20}{5} = 4.$$

So also the *ratio* of the *difference* of the *antecedents*, to the *difference* of the *consequents*, is the same. That is,

$$20 - 12 : 5 - 3 :: 12 : 3 = 20 : 5, \text{ or } \frac{20-12}{5-3} = \frac{12}{3} = \frac{20}{5} = 4.$$

If in several couplets the ratios are equal, *the sum of all the antecedents has the same ratio to the sum of all the consequents, which any one of the antecedents has to its consequent.*

Thus the ratio $\begin{cases} 12 : 6 = 2 \\ 10 : 5 = 2 \\ 8 : 4 = 2 \\ 6 : 3 = 2 \end{cases}$

Therefore the ratio of $(12+10+8+6) : (6+5+4+3) = 2$.

EXAMPLES FOR PRACTICE.

1. Which is the greater, the ratio of 11 : 9, or that of 41 : 35?

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2. Which is the greater, the ratio of $a+3 : \frac{1}{2}a$, or that of $2a+7 : \frac{1}{3}a$?

3. If the antecedent of a couplet be 65, and the ratio 13, what is the consequent?

4. If the consequent of a couplet be 7, and the ratio 13, what is the antecedent?

5. What is the ratio compounded of the ratios of 3 : 7, and $2a : 5b$, and $7x+1 : 3y-2$?

6. What is the ratio compounded of $x+y : b$, and $x-y : a+b$, and $a+b : h$?

7. If the ratios of $6x+7 : 2x-3$, and $x+2 : \frac{1}{2}x+3$ be compounded, will they produce a ratio of greater inequality, or of less inequality?

8. What is the ratio compounded of $x+y : a$, and $x-y : b$, and $b : \frac{x^2-y^2}{a}$?

9. What is the ratio compounded of $7 : 5$, and the duplicate ratio of 4 : 9, and the triplicate ratio of 3 : 2?

10. What is the ratio compounded of 3 : 7, and the triplicate ratio of $x : y$, and the subduplicate ratio of 49 : 9?

Proportion.

When four quantities are related to one another in such a manner that the first divided by the second is equal to the third divided by the fourth—in other words, when the ratio of the first to the second is equal to the ratio of the third to the fourth, the four are said to be in direct proportion. From this definition it will be seen, that proportion is simply the equality of ratios. Though we have only spoken of two equal ratios, there may be any number, and in all cases the terms of these ratios are said to be in direct proportion.

Care must be taken not to confound *proportion* with *ratio*. This caution is the more necessary, as in common discourse the two terms are used indiscriminately, or rather, proportion is used for both. The expenses of one man are said to bear a greater proportion to his income than those of another. But according to the definition which has just been given, one *proportion* is neither greater nor less than another. For *equality* does not admit of degrees. One *ratio* may be greater or less than another. The ratio of 12 : 2 is greater than that of 6 : 2, and less than that of 20 : 2. But these differences are not applicable to *proportion*, when the term is used in its technical sense. The loose signification which is so frequently attached to this word, may be proper enough in *familiar language*; for it is sanctioned by general usage. But for scientific purposes, the *distinction* between *proportion* and *ratio* should be clearly drawn, and cautiously observed.

Proportion may be expressed, either by the common sign of equality, or by four points between the two couplets.

Thus $\left\{\begin{array}{l} 8 \cdot\cdot 6 = 4 \cdot\cdot 2, \text{ or } 8 \cdot\cdot 6 :: 4 \cdot\cdot 2 \\ a \cdot\cdot b = c \cdot\cdot d, \text{ or } a \cdot\cdot b :: c \cdot\cdot d \end{array}\right\}$ are arithmetical proportions.

And $\left\{\begin{array}{l} 12 : 6 = 8 : 4, \text{ or } 12 : 6 :: 8 : 4 \\ a : b = d : h, \text{ or } a : b :: d : h \end{array}\right\}$ are geometrical proportions.

The latter is read, "the ratio of a to b equals the ratio of d to h;" or more concisely, "a is to b as d to h."

The first and last terms are called the *extremes*, and the other two the *means*. *Homologous* terms are either the two antecedents or the two consequents. *Analogous* terms are the antecedent and consequent of the same couplet.

As the ratios are equal, it is manifestly immaterial which of the two couplets is placed first.

If $a : b :: c : d$, then $c : d :: a : b$. For if $\frac{a}{b}=\frac{c}{d}$ then $\frac{c}{d}=\frac{a}{b}$.

The *number* of *terms* in a proportion must be at least *four*. For the equality is between the ratios of *two couplets*; and each couplet must have an antecedent and a consequent. There may be a proportion, however, between *three quantities*. For one of the quantities may be *repeated*, so as to form two terms. In this case the quantity repeated is called the *middle term*, or a *mean proportional* between the two other quantities, especially if the proportion is geometrical.

Thus the numbers 8, 4, 2, are proportional. That is, 8 : 4 :: 4 : 2. Here 4 is both the consequent in the first couplet, and the antecedent in the last. It is therefore a mean proportional between 8 and 2.

The *last* term is called a *third proportional* to the two other quantities. Thus 2 is a third proportional to 6 and 4.

Inverse or *reciprocal* proportion is an equality between a *direct* ratio and a *reciprocal* ratio.

Thus $4 : 2 :: \frac{1}{3} : \frac{1}{6}$; that is, 4 is to 2 *reciprocally*, as 3 to 6. Sometimes, also, the order of the terms in one of the couplets is inverted, without writing them in the form of a fraction.

Thus 4 : 2 :: 3 : 6 inversely. In this case, the *first* term is to the *second*, as the *fourth* to the *third*; that is, the first divided by the second, is equal to the fourth divided by the third.

When there is a series of quantities, such that the ratios of the first to the second, of the second to the third, of the third to the fourth, etc., are *all equal*; the quantities are said to be in *continued proportion*. The consequent of each preceding ratio is then the antecedent of the following one.

N.B. Continued proportion is also called *progression*.

In the preceding articles of this section, the general properties of ratio and proportion have been defined and illustrated. It now remains to consider the principles which are peculiar to each kind of proportion, and attend to their practical application in the solution of problems.

Arithmetical Proportion and Progression.

If *four* quantities are in arithmetical proportion, *the sum of the extremes is equal to the sum of the means.*

Thus If	$a \cdot\cdot b :: h \cdot\cdot m$, then	$a+m=b+h$
For by supposition,		$a-b=h-m$
And transposing $-b$ and $-m$,		$a+m=b+h$

So in the proportion, $12 \cdot\cdot 10 :: 11 \cdot\cdot 9$, we have $12+9=10+11$.

Again, if *three* quantities are in arithmetical proportion, *the sum of the extremes is equal to double the mean.*

If $a \cdot\cdot b :: b \cdot\cdot c$, then,	$a-b=b-c$
And transposing $-b$ and $-c$,	$a+c=2b$.

Quantities, which *increase* by a common difference, as 2, 4, 6, 8, 10, etc., or *decrease* by a common difference, as 15, 12, 9, 6, 3, etc., are in *continued arithmetical proportion*.

Such a series is also called an *arithmetical progression*; and sometimes *progression by difference*, or *equidifferent series*.

When the quantities *increase*, they form what is called an *ascending* series, as 3, 5, 7, 9, 11, etc.

When they *decrease*, they form a *descending* series, as 11, 9, 7, 5, 3, etc.

The natural numbers, 1, 2, 3, 4, 5, 6, etc., are in arithmetical progression ascending.

From the definition it is evident that in an *ascending* series, each succeeding term is found by *adding the common difference* to the preceding term.

If the first term is 3, and the common difference 2;

The series is 3, 5, 7, 9, 11, 13, etc.

If the first term is a, and the common difference d,

Then $a+d$ is the second term, $a+d+d=a+2d$ the third, $a+2d+d=a+3d$ the 4th, $a+3d+d=a+4d$ the 5th, etc.

1st 2nd 3rd 4th 5th

And the series is a, $a+d$, $a+2d$, $a+3d$, $a+4d$, etc.

If the first term and the common difference are the *same*, the series becomes more simple. Thus if a is the first term, and also the common difference, and n the number of terms,

Then $a+a=2a$, is the second term,

$2a+a=3a$, the third, etc.

And the series is a, $2a$, $3a$, $4a$, ... na.

In a *descending* series, each succeeding term is found by *subtracting the common difference* from the preceding term.

If a is the first term, and d the common difference, the

1st 2nd 3rd 4th 5th

series is a, $a-d$, $a-2d$, $a-3d$, $a-4d$, etc.

In this manner we may obtain any term by continued addition or subtraction. But in a long series, this process

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would become tedious. There is a method much more expeditious. By attending to the series,

1st 2nd 3rd 4th 5th
$a, a+d, a+2d, a+3d, a+4d$, etc.,

it will be seen that the number of times d is added to a, is *one less* than the number of the term. Thus,

The *second* term is $a+d$, *i. e.* a added to *once* d;
The *third* is $a+2d$, a added to *twice* d;
The *fourth* is $a+3d$, a added to *thrice* d; ate.

So if the series be continued,

The 50th term will be $a+49d$,
The 100th term $a+99d$.

If the series be *descending*, the 100th term will be $a-99d$.

In the *last* term, the number of times d is added to a, is *one less* than the number of all the terms. If then d = the common difference, a = the first term, z = the last, n = the number of terms, we shall have in all cases,

$$z = a \pm (n-1) \times d; \text{ that is,}$$

1. To find the last term of an ascending series.

Add to the first term the product of the common difference into the number of terms minus one, and the sum will be the last term.

2. To find the last term of a descending series.

From the first term subtract the product of the common difference into the number of terms minus one, and the remainder will be the last term.

N.B. Any other term may be found in the same way. For the series may be made to stop at any term, and that may be considered, for the time, as the last.

Thus the mth term $= a \pm (m-1) \times d$.

Prob. 1. If the first term of an ascending series is 7, the common difference 3, and the number of terms 9, what is the last term? Ans. $z = a + (n-1)\,d = 7 + (9-1) \times 3 = 31$.

Prob. 2. If the first term of a descending series is 60, the common difference 5, and the number of terms 12, what is the last term? Ans. $z = a - (n-1)\,d = 60 - (12-1) \times 5 = 5$.

Prob. 3. If the first term of an ascending series be 9, and the common difference 4, what will the 5th term be?

Ans. $z = a + (n-1) \times d = 9 + (5-1) \times 4 = 25$.

There is one other inquiry to be made concerning a series in arithmetical progression. It is often necessary to find the *sum of all the terms*. This is called the *summation* of the series. The most obvious mode of obtaining the amount of the terms is to add them together. But the nature of progression will furnish us with a more expeditious method.

Let us take, for instance, the series 3, 5, 7, 9, 11,
And also the same inverted, 11, 9, 7, 5, 3,

The sums of the terms will be, 14, 14, 14, 14, 14.

Take also the series $a \quad a+d, a+2d, a+3d, a+4d,$
And the same inverted, $a+4d, a+3d, a+2d, a+d, a$

The sums will be, $2a+4d, 2a+4d, 2a+4d, 2a+4d, 2a+4d$

Hence it will be perceived that the sum of *all* the terms in the double series, is equal to the sum of the extremes repeated as many times as there are terms. Thus,

The sum of 14, 14, 14, 14 and 14 $= 14 \times 5$,

And the sum of the terms in the other double series is $(2a+4d) \times 5$.

But this is *twice* the sum of the terms in the *single* series. If then we put

a = the first term, n = the number of terms,
z = the last, s = the sum of the terms,

we shall have this equation, $s = \frac{a+z}{2} \times n$. Hence,

To find the sum of all the terms in an arithmetical progression.

Multiply half the sum of the extremes into the number of terms, and the product will be the sum of the given series.

Prob. 4. What is the sum of the natural series of numbers 1, 2, 3, 4, 5, etc., np to 1000?

Ans. $s = \frac{a+z}{2} \times n = \frac{1+1000}{2} \times 1000 = 500500$.

The two formulæ, $z = a \pm (n-1)d$, and $s = \frac{a+z}{2} \times n$, contains five different quantities; viz., a, *the first term*; d, *the common difference*; n, *the number of terms*; z, *the last term*; *and* s, *the sum of all the terms.*

From these two formulæ others may be deduced by which, if any *three* of the *five* quantities are given, the remaining two may easily be found. The most useful of these formulæ are the following:—

By the first formula,

1. *The last term*, $z = a \pm (n-1)\,d$; in which a, n and d are given.

Transposing $(n-1)\,d$,

2. *The first term*, $a = z \mp (n-1)\,d$; z, n and d being given.

Transposing a in the 1st, and dividing by $n-1$,

3. *The common difference*, $d = \frac{z-a}{n-1}$; a, z and n being given.

Transposing and dividing,

4. *The number of terms*, $n = \frac{z-a}{d} + 1$; a, z and d being given.

By the second formula,

5. *The sum of the terms*, $s = \frac{a+z}{2} \times n$; a, z and n being given.

Or by substituting for z its value,

$s = \frac{2a+(n-1)d}{2} \times n$; in which a, n and d are given.

Reducing the preceding equation,

6. *The first term*, $a = \frac{2s-dn^2+dn}{2n}$; s, d and n being given.

7. *The common difference*, $d = \frac{2s-2an}{n^2-n}$; s, a and n being given.

8. *The number of terms* $n = \frac{\sqrt{(2a-d)^2+8ds} - 2a + d}{2d}$; a, d and s being given.

LESSONS IN ITALIAN GRAMMAR.—No. XLI.

Fifthly.—Verbs ending in *ggere.*

Léggere, to read.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *léggere*, to read	Past: *avére létto*, to have read
Present Gerund: *leggèndo*, reading	Past Gerund: *avéndo létto*, having read
Past Participle: *létto*, read	

Indicative Mood.

Present.	Imperfect.
Léggo, I read	*Leggéva* or *leggén*, I was reading
légi, thou readest	*leggévi*, thou wast reading
légge, he reads	*leggéva* or *leggéa*, he was reading
leggiámo, we read	*leggevámo*, we were reading
leggéte, you read	
léggono, they read	

leggevàte, you were reading
leggévano, they were reading

Indeterminate Preterite.

Léssi, I read
leggésti, thou readest
lésse, he read
leggémmo, we read
leggéste, you read
léssero, they read

Future.

Leggerò, I shall or will read
leggerài, thou wilt read
leggerà, he will read
leggerémo, we will read
leggeréte, you will read
leggeránno, they will read

Conditional Present.

Leggeréi, I should or would read
leggerésti, thou wouldst read
leggerébbe or *leggería*, he would read
leggerémmo, we would read
leggeréste, you would read
leggerébbero, they would read

Imperative Mood.

[No First Person.]
Léggi, read (thou)
légga, let him read
leggiámo, let us read
leggéte, read (ye or you)
léggano, let them read

Subjunctive Mood.

Present.	Imperfect.
Che légga, that I may read	*Che leggéssi*, that I might read
che légga, that thou mayst read	*she leggéssi*, that thou mightst read
che légga, that he may read	*she leggésse*, that he might read
che leggiámo, that we may read	*she leggéssimo*, that we might read
she leggiáte, that you may read	*she leggéste*, that you might read
she léggano, that they may read	*che leggéssero*, that they might read

So conjugate—

Infinitive.	Present.	Indet. Pret.	Past Part.	English.
Affiggere,	*affiggo*,	*affissi*,	*affisso*,	to affix.
Afflíggere,	*afflíggo*,	*afflíssi*,	*afflítto*,	afflict.
Configgere,	*configgo*,	*confissi*,	*confítto*,	nail.
Corréggere,	*corréggo*,	*corréssi*,	*corrétto*,	correct.
Crocifiggere,	*crocifiggo*,	*crocifissi*,	*crocifisso*,	crucify.
Distrúggere,	*distrúggo*,	*distrússi*,	*distrútto*,	destroy.
Elèggere,	*elèggo*,	*elèssi*,	*elètto*,	elect.
Erèggere,	*erèggo*,	*erèssi*,	*erètto*,	erect.
Figgere,	*figgo*,	*fissi*,	*fítto* or *-sso*,	fix.
Friggere,	*friggo*,	*frissi*,	*fritto*,	fry.
Infiggere,	*infiggo*,	*infissi*,	*infitto* or *-sso*,	nail.
Preelèggere,	*preelèggo*,	*preelèssi*,	*preelètto*,	prefer.
Prefíggere,	*prefíggo*,	*prefíssi*,	*prefísso*,	resolve.
Protéggere,	*protéggo*,	*protéssi*,	*protétto*,	protect.
Rileggere,	*rileggo*,	*rilèssi*,	*rilètto*,	read again
Réggere,	*réggo*,	*réssi*,	*rétto*,	rule.
Struggere,	*strúggo*,	*strússi*,	*strútto*,	wear out.
Trafiggere,	*trafiggo*,	*trafissi*,	*trafisso* or *-tto*	pierce.

Sixthly.—Verbs ending in *gliere*.

Cógliere or *córre*, to gather.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *cógliere* or *córre*, to gather	Past: *avére cólto*, to have gathered
Present Gerund: *cogliéndo*, gathering	Past Gerund: *avéndo cólto*, having gathered
Past Participle: *cólto*, gathered	

Indicative Mood.

Present.

Cóglio or *cólgo*, I gather
cógli, thou gatherest
cóglie, he gathers
cogliámo, we gather
cogliéte, you gather
cógliono or *cólgono*, they gather

Imperfect.

cogliéva or *cogliéa*, I was gathering
cogliévi, thou wast gathering
cogliéva or *cogliéa*, he was gathering
cogliévamo, we were gathering
cogliévate, you were gathering
cogliévano, they were gathering

Indeterminate Preterite.

Cólsi, I gathered
cogliésti, thou gatheredst
cólse, he gathered
cogliémmo, we gathered
cogliéste, you gathered
cólsero, they gathered

Future.

Coglierò or *corrò*, I shall or will gather
coglierài or *corrài*, thou wilt gather
coglierà or *corrà*, he will gather
coglierémo or *corrémo*, we will gather
coglieréte or *corréte*, you will gather
coglierànno or *corránno*, they will gather

Conditional Present.

Coglieréi, *corréi*, or *corría*, I should or would gather
coglierésti or *corrésti*, thou wouldst gather
coglierébbe, *corrébbe*, *cogliería*, or *corría*, he would gather
coglierémmo or *corrémmo*, we would gather
coglieréste or *corréste*, you would gather
coglierébbero, *corrébbero*, *coglieríano*, or *corríano*, they would gather

Imperative Mood.

[No First Person.]
Cógli, gather (thou)
cólga or *cóglia*, let him gather
cogliámo, let us gether
coglíete, gather (ye or you)
cólgano or *cógliano*, let them gather

Subjunctive Mood.

Present.	Imperfect.
Che cóglia or *cólga*, that I may gather	*Che cogliéssi*, that I might gather
she cóglia or *cólga*, that thou mayst gather	*che cogliéssi*, that thou mightst gather
che cóglia or *cólga*, that he may gather	*che cogliésse*, that he might gather
che cogliámo, that we may gather	*che cogliéssimo*, that we might gather
che coglíate, that you may gather	*che coglíeste*, that you might gather
che cógliano or *cólgano*, that they may gather	*che cogliéssero*, that they might gather

So conjugate—

Infinitive.	Present.	Indet. Pret.	Past Part.	English.
Acco'gliere or *acco'rre*,	*acco'lgo*,	*acco'lsi*,	*acco'lto*,	to welcome
Distógliere or *disto'rre*,	*disto'lgo*,	*disto'lsi*,	*disto'lto*,	remove.
Racogliere or *racco'rre*,	*racco'lgo*,	*racco'lsi*,	*racco'lto*,	gather.
Scégliere or *scérre*,	*scélgo*,	*scélsi*,	*scélto*,	choose.
Scio'gliere or *scio'rre*,	*scio'lgo*,	*scio'lsi*,	*scio'lto*,	untie.
Sto'gliere or *sto'rre*,	*sto'lgo*,	*sto'lsi*,	*sto'lto*,	take off.
To'gliere or *to'rre*,	*to'lgo*,	*to'lsi*,	*to'lto*,	lay hold.

Seventhly.—Verbs ending in *guere*.

Distinguere, to note or distinguish.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *distinguere*, to distinguish	Past: *avére distínto*, to have distinguished
Present Gerund: *distinguéndo*, distinguishing	Past Gerund: *avéndo distínto*, having distinguished
Past Participle: *distínto*, distinguished	

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Indicative Mood.

Present.

Distíngue, I distinguish
distíngui, thou distinguishest
distíngue, he distinguishes
distinguiámo, we distinguish
distinguéte, you distinguish
distínguono, they distinguish

Imperfect.

Distinguéva, I distinguished
distinguévi, thou distinguishedst
distinguéva, he distinguished
distinguevámo, we distinguished
distinguevóte, you distinguished
distinguévano, they distinguished

Indeterminate Preterite.

Distínsi, I distinguished
distinguésti, thou distinguishedst
distínse, he distinguished
distinguémmo, we distinguished
distinguéste, you distinguished
distínsero, they distinguished

Future.

Distinguerò, I shall or will distinguish
distinguerái, thou wilt distinguish
distinguerá, he will distinguish
distinguerémo, we will distinguish
distingueréte, you will distinguish
distingueránno, they will distinguish

Conditional Present.

Distinguerèi, I should or would distinguish
distinguerésti, thou wouldst distinguish
distinguerébbe, he would distinguish
distinguerémmo, we would distinguish
distingueréste, you would distinguish
distinguerébbero, they would distinguish

Imperative Mood.

[No First Person.]
Distíngui, distinguish (thou)
distíngua, let him distinguish
distinguiámo, let us distinguish
distinguéte, distinguish (ye or you)
distínguano, let them distinguish

Subjunctive Mood.

Present.

Che distíngua, that I may distinguish
che distíngua, that thou mayst distinguish
che distíngua, that he may distinguish
che distinguiámo, that we may distinguish
che distinguiáte, that you may distinguish
che distínguano, that they may distinguish

Imperfect.

Che distinguéssi, that I might distinguish
che distinguéssi, that thou mightst distinguish
che distinguésse, that he might distinguish
che distinguéssimo, that we might distinguish
che distinguéste, that you might distinguish
che distinguéssero, that they might distinguish

So conjugate—

Estínguere, to put out | *Stínguere*, to extinguish
Ridistínguere, to explain more clearly.

Vocabulary.

Buóna, buón, good
dì, a day
cóme, how
bène, well
troppo, too, very
così, così, so, so
obligáre, to oblige
fratéllo, a brother
gústo, pleasure
témpo, time
oggi, to-day
sédia, a seat
necessário,—, necessary
visíta, a visit
fare una visíta, to pay a visit
qui, here
vícino, near
affrettáre, to hurry, hasten
molto affrettáto, in a great hurry
tornáre, to turn, return
adésso, directly, now
adío, adieu, good bye
ave, whera
padro'ne, master, potron
dormíre, to sleep
svegliáto, awaka
levato, raised, up
letto, a bed
vergo'gna, shame
jéri, yesterday
tanto, so
tardi, late
levársi, to raise one's self, get up
dopo, after
cena, a supper
vi, one, they, we
ballàre, to dance
cantáre, to sing
ridere, to laugh
giuocáre, to play
scacchi, chess
quanto, how
dispiacére, to displease
mi dispiáce, I am vexed
sapére, to know
víncere, to conquer, to beat
fin a, till
mezza,—a, middle, mid, half
notte, night
meravigliársi, to wonder, be surprised
ótto, eight; *le ótto* (*ore* understood), eight o'clock
sonáre, to sound, strike
adúnque, then
quanto prima, as soon as possible
sera, a evening
ringraziáre, to thank
soro're, a sister
dame (pl.), (the game of) draughts

Italian-English.

Buón dì a Vossignoría. Come stà V. S. ?* Non tróppo bene; così, così, sóno obligáto a V. S. Come stà il signór suo fratéllo? Non stà bena. Avrà gusto di vedérla.† Non avrò tempo di vedérlo oggi. V. S. seda. Date una sédia al signór. Non è necessário. Bisógna che vada a fáre una visíta qui vicíno. E molto affrettáta V. S. Tornerò adésso, adésso. ‡ Adío, signóro. Ho gran gusto di vedérla in buóna saláte.

Ove 'l tuo padróna? dorme ancóra? Signor, nò, è svegliáto. E leváto? Signor, nó, stà ancóra al latto. Che vergógna di stare al letto à quest' ora! Andái jeri al letto tanto tardi, che non ho potúto levármi à huón ora.

Che si fece qui dopo cena? Si ballò, si cantò, si rise, si giuocò. Che fécero gli altri? Giuochrono o scacchi. Quanto mi dispiáce, non avérlo sapúto! Chi ha vinto? Chi ha perdúto? Ho vinto. Fin a che ora a' è giuocáto? Fin alle due dopo mezza notte. A che ore siéte endáto al letto? Alle tre e mezza. Non mi meraviglio che vi leviáta così tardi. Che ora è?§ Che ora [credéta che sia? Credo che non siano ancóra le otto. Come le otto! sóno sonáte le diéci. Bisógna adúnque che mi lévi quanto prima.

English-Italian.

Good evening, sir. How do you do, madam? Very well, I thank you. How is your sister? She is not very well. I shall be very glad to see her. You will not have time to go to-day. Take a seat, madam. I am not well. We shall be very glad to see you. You must go and pay a visit near here. I am in a great hurry. He will return directly. I was very glad (say, I had great pleasure) to see him in good health. Where are your brothers? They are still asleep. Is she up? Are you still in bed? What a shame! Did you go to bed so late last night that you could not get up early this morning? He is not in bed at this time of day (say, this hour). What did your brothers do yesterday after dinner? They danced, they sang, they laughed, and they played. At what games? At chess, draughts, and other games. He is vexed he did not know it. I won; he lost. How late (say, till what hour) did your brother and sister play? Till three o'clock in the morning. What o'clock does he think it is? He thinks it is not two yet. It has struck eight. You must get up as soon as possible. They went to bed so late last night, that they could not get up early in the morning. I am surprised that they are in bed at this time of day. Are they not awake? No, sir, they are still asleep. At what time did they come last night? At half-past ten. How late did they dance? Till half-past three in the morning? They must get up as soon as possible. I am very glad to see you. He was very glad to see me. They are in a great hurry. Good bye, madam. Good morning, sir. We shall return directly. What a shame, to go to bed so late!

* An abbreviation for *Vossignoría*, meaning "sir," or "madam."
† To see you. *La* agrees with *Vostra Signoría* understood.
‡ The repetition merely strengthens the meaning.
§ What o'clock is it?

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LESSONS IN SPANISH.—No. IX.

Conjugation.—*Continued.*

As the auxiliary verbs are required to form the compound tenses of every other verb, we first give the conjugation of them.

Haber, to have.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *haber*, to have.	Past: *haber habido*, to have had.
Present Gerund: *habiendo*, having.	Past Gerund: *habiendo habido*, having had.
Past Participle: *habido*, had.	

Indicative Mood.

Present.	Perfect Indefinite.
Yo he, I have.	*Yo he habido*, I have had.
Tú has, thou hast.	*Tú has habido*, thou hast had.
El ha, he has.	*El ha habido*, he has had.
Nosótros hémos, we have.	*Nosótros hémos habido*, we have had.
Vosótros habéis, ye have.	*Vosótros habéis habido*, ye have had.
Ellos han, they have.	*Ellos han habido*, they have had.
Imperfect.	**First Pluperfect.**
Yo había, I had.	*Yo había habido*, I had had.
Tú habías, thou hadst.	*Tú habías habido*, thou hadst had
El había, he had.	*El había habido*, he had had.
Nosótros habíamos, we had.	*Nosótros habíamos habido*, we had had.
Vosótros habíais, ye had.	*Vosótros habíais habido*, ye had had.
Ellos habían, they had.	*Ellos habían habido*, they had had.
Perfect Definite.	**Second Pluperfect.**
Yo húbe, I had.	*Yo húbe habido*, I had had.
Tú hubiste, thou hadst.	*Tú hubiste habido*, thou hadst had.
El húbo, he had.	*El húbo habido*, he had had.
Nosótros hubímos, we had.	*Nosótros hubímos habido*, we had had.
Vosótros hubísteis, you had.	*Vosótros hubísteis habido*, you had had.
Ellos hubiéron, they had.	*Ellos hubiéron habido*, they had had.
First Future.	**Second Future.**
Yo habré, I shall or will have.	*Yo habré habido*, I shall or will have had.
Tú habrás, thou shalt or wilt have.	*Tú habrás habido*, thou shalt or wilt have had.
El habrá, he shall or will have.	*El habrá habido*, he shall or will have had.
Nosótros habrémos, we shall or will have.	*Nosótros habrémos habido*, we shall or will have had.
Vosótros habréis, you shall or will have.	*Vosótros habréis habido*, you shall or will have had.
Ellos habrán, they shall or will have.	*Ellos habrán habido*, they shall or will have had.

Imperative Mood.

[No First Person.]

Ha tú, have thou.
Haya él, let him have, or, may he have
Hayamos nosótros, let us have, or, may we have.
Habéd vosótros, have you.
Hayan ellos, let them have, or, may they have.

Subjunctive Mood.

Present.	Perfect Indefinite.
Yo haya, I may have.	*Yo haya habido*, I may have had
Tú hayas, thou mayest have.	*Tú hayas habido*, thou mayest have had.
El haya, he may have.	*El haya habido*, he may have had
Nosótros hayamos, we may have.	*Nosótros hayamos habido*, we may have had.
Vosótros hayais, you may have.	*Vosótros hayais habido*, you may have had.
Ellos hayan, they may have.	*Ellos hayan habido*, they may have had.
Imperfect.	**Pluperfect.**
Yo hubiéra, habría, or *hubiése*, I would, should, or might have.	*Yo hubiéra, habría*, or *hubiése habido*, I would, should, or might have had.
Tú hubiéras, habrías, or *hubiéses*, thou wouldst, shouldst, or mightst have.	*Tú hubiéras, habrías*, or *hubiéses habido*, thou wouldst, shouldst, or mightst have had.
El hubiéra, habría, or *hubiése*, he would, should, or might have.	*El hubiéra, habría*, or *hubiése habido*, he would, should, or might have had.
Nosótros hubiéramos, habríamos, or *hubiésemos*, we would, should, or might have.	*Nosótros hubiéramos, habríamos*, or *hubiésemos habido*, we would, should, or might have had.
Vosótros hubiérais, habríais, or *hubiéseis*, you would, should, or might have.	*Vosótros hubiérais, habríais*, or *hubiéseis habido*, you would, should, or might have had.
Ellos hubiéran, habrían, or *hubiésen*, they would, should, or might have.	*Ellos hubiéran, habrían*, or *hubiésen habido*, they would, should, or might have had.
First Future.	**Second Future.**
Si yo hubiére, if I should have.	*Si yo hubiére habido*, if I should have had.
Si tú hubiéres, if thou shouldst have.	*Si tú hubiéres habido*, if thou shouldst have had.
Si él hubiére, if he should have.	*Si él hubiére habido*, if he should have had.
Si nosótros hubiéremos, if we should have.	*Si nosótros hubiéremos habido*, if we should have had.
Si vosótros hubiéreis, if you should have.	*Si vosótros hubiéreis habido*, if you should have had.
Si éllos hubiéren, if they should have.	*Si éllos hubiéren habido*, if they should have had.

By examining the above conjugation, it will be seen that, after having learnt the simple tenses, the compound ones are also known, as these latter are always formed by placing the past participle after the persons of the simple tenses of the auxiliary verb.*

The personal pronouns of the nominative case are seldom used with the verb, as the ending of the person of each tense generally indicates the person and number of its nominative. Thus, the first person plural of every tense has its ending in *mos*: when, therefore, the learner sees any tense of a verb having for its final letters *mos*, he may know that its nominative is to be rendered in English by the pronoun *we*. In the conjugations which follow, the pronouns will be omitted in Spanish.

Ser, to be.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *ser*, to be.	Past: *haber sido*, to have been.
Present Gerund: *siendo*, being.	Past Gerund: *habiendo sido*, having been.
Past Participle: *sido*, been.	

* Perhaps one of the easiest methods of learning the conjugations of the verbs is to copy and re-copy each tense till it can be done without referring to the Grammar.

Indicative Mood.

Present.	Perfect Indefinite.
Soy, I am.	*He sido*, I have been.
Eres, thou art.	*Has sido*, thou hast been.
Es, he is.	*Ha sido*, he has been.
Sómos, we are.	*Hémos sido*, we have been.
Sóis, you are.	*Habéis sido*, you have been.
Son, they are.	*Han sido*, they have been
Imperfect.	**First Pluperfect.**
Era, I was.	*Había sido*, I had been.
Eras, thou wast.	*Habías sido*, thou hadst been.
Era, he was.	*Había sido*, he had been.
Éramos, we were.	*Habíamos sido*, we had been.
Erais, you were.	*Habíais sido*, you had been.
Eran, they were.	*Habían sido*, they had been.
Perfect Definite.	**Second Pluperfect.**
Fuí, I was.	*Hube sido*, I had been.
Fuiste, thou wast.	*Hubiste sido*, thou hadst been.
Fué, he was.	*Hubo sido*, he had been.
Fuímos, we were.	*Hubimos sido*, we had been.
Fuísteis, you were.	*Hubisteis sido*, you had been.
Fuéron, they were.	*Hubiéron sido*, they had been.
First Future.	**Second Future.**
Seré, I shall or will be.	*Habré sido*, I shall or will have been.
Serás, thou shalt or wilt be.	*Habrás sido*, thou shalt or wilt have been.
Será, he shall or will be.	*Habrá sido*, he shall or will have been.
Seremos, we shall or will be.	*Habremos sido*, we shall or will have been.
Seréis, you shall or will be.	*Habréis sido*, you shall or will have been.
Serán, they shall or will be	*Habrán sido*, they shall or will have been.

Imperative Mood.

[No First Person.]

Sé, be thou.
Séa, let him be, or, may he be.
Seámos, let us be, or, may we be.
Séd, be you.
Séan, let them be, or, may they be.

Subjunctive Mood.

Present.	Perfect Indefinite.
Séa, I may be.	*Háya sido*, I may have been.
Séas, thou mayest be.	*Háyas sido*, thou mayest have been.
Séa, he may be.	*Háya sido*, he may have been.
Seámos, we may be.	*Háyamos sido*, we may have been.
Seáis, you may be.	*Háyais sido*, you may have been
Séan, they may be.	*Háyan sido*, they may have been
Imperfect.	**Pluperfect.**
Fuéra, sería, or *fuése*, I would, should, or might be.	*Hubiéra, habría*, or *hubiése sido*, I would, should, or might have been.
Fuéras, serías, or *fuéses*, thou wouldst, shouldst, or mightst be.	*Hubiéras, habrías*, or *hubiéses sido*, thou wouldst, shouldst, or mightst have been.
Fuéra, sería, or *fuése*, he would, should, or might be.	*Hubiéra, habría*, or *hubiése sido*, he would, should, or might have been.
Fuéramos, seríamos, or *fuésemos*, we would, should, or might be.	*Hubiéramos, habríamos*, or *hubiésemos sido*, we would, should, or might have been.
Fuérais, seríais, or *fueseis*, you would, should, or might be.	*Hubiérais, habríais*, or *hubiéseis sido*, you would, should, or might have been.
Fuéran, serían, or *fuésen*, they would, should, or might be.	*Hubiéran, habrían*, or *hubiésen sido*, they would, should, or might have been.

First Future.	Second Future.
Si fuére, if I should be.	*Si hubiére sido*, if I should have been.
Si fueres, if thou shouldst be.	*Si hubiéres sido*, if thou shouldst have been.
Si fuére, if he should be.	*Si hubiére sido*, if he should have been.
Si fuéremos, if we should be.	*Si hubiéremos sido*, if we should have been.
Si fuéreis, if you should be.	*Si hubiéreis sido*, if you should have been.
Si fuéren, if they should be.	*Si hubiéren sido*, if they should have been.

Remark.—To commit the conjugations of the Spanish verbs to memory may seem a difficult task, yet if the learner will faithfully follow the directions contained in the lessons, we think he will be enabled to learn the variations of person and number in all the moods and tenses of the different verbs, without any very laborious effort on his part. The irregular auxiliary verb *haber*, should be copied and re-copied, each tense at a time, till it is thoroughly learnt, that is, till the pupil can readily write all the persons of each tense without referring to the conjugated form, pronouncing and accenting all properly as he copies. After having committed this verb to memory, he will be prepared to conjugate the compound tenses of any other verb.

Vocabulary.

Abogado, lawyer, barrister.	*Soldado*, soldier.
Jóven, young.	*Criado*, created.
Pequeño, little, small.	*Castigado*, punished.
Fiel, faithful.	*Escrito*, written.
Feliz, fortunate, happy.	*Engañado*, deceived.
Prudente, prudent.	*Imprudente*, imprudent.
Barato, cheap.	*Económico*, economical.
Puntual, punctual.	*Probable*, probable.
Negligente, negligent.	*Diligente*, diligent.
Frugal, frugal.	*Quiero*, I wish.
Créo, I believe.	*Puede*, (he) can, (he) is able.
Pretende, (he) pretends.	*Preciso es*, / *Es preciso*, } it is necessary.
¡Ojalá! O that! would that!	*Ahora*, now.
Nunca, never.	*Lindo*, pretty.

Model Sentences.

Somos Alemanas, we are German-women.	*No créo que tú séas mas diligente que yo*, I do not believe that thou art more diligent than I.
Madrid era pequeña, pero ahora es grande, Madrid was small, but now is large.	*¡Ojalá hubiese yo sido fiel á él*, O that I had been faithful to him!
Pedro será abogado, Peter will be a lawyer.	*Siendo como V. es tan negligente, ¿quién le dará á V. libros?* being so negligent as you are, who will give you books?
Es posible que V. no séa premiado, It is possible that you may not be rewarded.	
Si yo fuese rico, no sería soberbio, If I were rich, I should not be proud.	

Spanish-English.

Soy hijo del juez. Tú eres jóven. ¿Soy yo rico? Vms. son jóvenes. La cuchara no es de oro. Pedro es robusto. El azúcar es dulce. Este libro es de María. Estos tenedores son de plata. Estas señoras son Francesas. V. es Español. Vms. son Alemanes. Somos Españoles. Sois Ingleses. Son Ingleses. Somos Inglesas. Vms. son Ingleses. Soy Aleman. Es Española.* Erea Inglesa. Somos carpinteros. Sois pintores. Eres zapatero. Es médico. Soy librero. Somos jueces.

Pedro era posadero. Mis hermanos eran sombrereros, pero ahora son carpinteros. Tu padre era panadero, y ahora es librero. Eras médico. Yo era abogado. Eran soldados.

* *Es Española*, "she-is a Spanish-woman." *Es Español*, "he-is a Spanish-man," or "Spaniard."

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Éramos zapateros. Eraie abogados. Vm. era juez. Vms. eran libreros. Eran impresores, pero ahore son carpinteros. Ella no era una hermosura. ¿No era yo mas robusto que él? ¿Eran abogados? ¿Mis hermanas no eran tan culpables como ella? Erais impresores. Yo era general. Estas ciudades aran pequeñas, pero ahors son grandes.

El hombre fué criado. Fuí castigado. Esta carta fué escrita pore mi madre. Fuimos castigados. Las cartas fueron escritas pare las Francesas. Fuiste castigado. Vmd. fué premiado. Vme. fuerou premiados. Fuísteis castigados. ¿Fuí premiado? La Española fué premiada. Ful jóven.

Mi madre ha sido desgraciada. Ha sido desgraciado. Has sido premiado. Hen sido fieles. Hemos sido castigados. Ha sido castigado. Habeis sido fieles. Ella ha sido hermosa. El abogado ha sido desgraciado. Vms. han sido premiados. He sido feliz. Vm. ha sido fiel. Mi hermana había sido imprudente. Habiamos sido imprudentes. Yo había sido castigado. V. había sido premiado. Vms. habían sido imprudentes. Habíais sido castigados.

Serán premiados. Juan será soldado. Mis hermanos serán abogados. María será una hermosura. Seré médico. Serás soldados. Vms. serán premiados. Serás castigado. Seré rico. Pedro será mas rico que Juan, pero Juan será ménos ignorante que Pedro. El vino será berato este año. La harina será barata. El azúcar será caro. Nunca serás juez. No serán premisdos segun sus obras. ¿Los criados serán castigados? Nunca seréis abogados. Los buenos serán premiados.

Sé fiel. Sé bueno. Sed fieles. Sed puntuales. Sé puntual. Seámos buenos y sábios. Sés el criado premiado. Séan las criadas castigadas. Séa Joan tan fiel como Pedro. Séan Vme. felices. Sés V. muy feliz. Séan los impíos castigados. Que las cartas séan escritas. Sés el impresor premiado.

Quiero que* Juan séa rico. Quiero que mis amigos sean buenos. Quiero que V. sea económico. Quiero que seas feliz. Quiero que seáis económicos. Es posible que no seas pobre. Muy probable es† que nunca seáis ricos. Es† posible que Juan no sea castigado. Muy probie es que estas señoras nunca sean premiadas.

Preciso era‡ que ella fuese castigada. Preciso era que fuesen puntuales. Era‡ preciso que no fuésemos negligentes. Era preciso que los pintores fuesan económicos. ¿No sería este librero el mejor de los dos? Si yo fuese vmd., yo sería puntual. Si yo fuere rico, yo sería económico. Si fueran ricos, serían soberbios.

No créo qua vuestra madre haya jamás (*ever*) sido linda. No créo que Vme. hayan jamás (*ever*) sido prudentes. ¡Ojalá hubiese yo sido frugal! ¡Ojalá hubiesen sido prudentes! ¡Ojalá hubiéseis sido frugales! Serás premiado, si fueres diligente. Quiero ser prudente. Quiero ser diligente. El qua es mal hijo no puede ser bueu padre. El qua es impío, no puede ser amable. Pretende no haber sido engañado. Pretende no haber sido castigado. Siendo como eres tan imprudente, ¿quién te dará dinero? Habiendo sido engañado por sus amigos, les escribió muchas cartas.

English-Spanish.

I am a soldier. Thou ert a lawyer. They are young. He is diligent. I am frugal. Ye are negligent. You (*Vmd.*) are punctual. They are fortunete. I am small. She is small § and pretty. You (*Vms.*) are prudent. I am a son of the judge. Am I imprudent? The spoon is of gold. These forks are of silver. The ladies are French-women. You (*Vmd.*) are a Spaniard. Ye are English-women. We are Germans. I am an Englishman. She is a Spanish woman. Thou art a physician. He is a bookseller. Ye are painters. They are shoemakers.

[In the following paragraph, the past tense in English is to be rendered in Spanish by the imperfect of the indicative.]

Peter was an innkeeper. My brothers were batters, but now are carpentere. Thy father was a baker, and now is a bookseller. Thou wast a physician. I was a lawyer. They were soldiers. We were shoemakers. Ye were lawyers. You (*Vmd.*) were a judge. You (*Vms.*) were booksellers. They were printers, but now are carpenters. She was not a (*una*) beauty. Was I not more robust than he? Were they lawyers? Were[4] not[3] my[1] sisters[2] so culpable as she? Ye were printers. I was a general. These cities were small, but now they are large (*grandes*).

[In the following paragraph, the Spanish perfect-definite of the indicative is to be used.]

Man was created. I was punished. This letter was written* for my mother. We were punished.§ The letters were written* for the French-women. Thou wast punished. You (*Vmd.*) were rewarded. You (*Vms.*) were rewarded. Ye were punished. I was rewarded. I was young. The Spanish-woman was rewarded.

My mother has been unfortunate. Thou hast been rewarded. They have been faithful. We have been punished. I have been punished. Ye have been faithful. She has been beautiful. The lawyer has been unfortunate. You (*Vms.*) have been rewarded. I have been fortunate. You (*Vm.*) have been faithful. My brother had been imprudent. We had been imprudent. I had been punished. You (*V.*) had been rewarded. You (*Vms.*) had been imprudent. Ye had been punished.

They shall-be rewarded. John will be a soldier. My brothers will be lawyers. You (*Vms.*) will be rewarded. Thou wilt be punished. I shall be rich. Peter will be richer than John, but John will be less ignorant than Pater. Wine will be cheap this year. Flour will be cheap. Sugar will be dear. Never wilt-thou-be a judge. They will not be rewarded according-to their works. Will[3] the[1] male-servants[2] be rewarded? Never will-ye-be lawyers. The good shall-be rewarded.

Be-thou faithful. Be-thou good. Be-ye faithful. Be-ye punctual. Be-thou punctuel. Let-us-be good and wise. May the male-servant be rewarded. Let the female-servants be rewarded. May John be faithful as Peter. May you (*Vms.*) be happy. May you (*Vm.*) be very fortunate. Let the impious be punished. Let the letters be written. Let the printer be rewarded.

I-wish that (*que*) John may-be rewarded. I-wish that my friends may be good. I-wish that you (*V.*) may be economical. I-wish that thou mayest-be happy. I-wish that ye may be economical. It-is (*es*) possible that thou mayest not be poor. It-is very probable that ye may never be rich. It-is possible that John may not be punished. It-is very probable that these ladies never may be rewarded.

It was (*era*) necessary that she should-be punished. It was necessary that they should-be punctual. It-was necessary that we should not be negligent. It-was necessary that the painters should-be economical. Would not this bookseller be the better of the two? If (*si*) I were (should-be) you (*Vmd.*), I would-be punctual. If I were (should-be) rich. I would be economical. If they were (should be) rich, they would be proud.

I do not believe that the physician's mother has (may have) ever (*jamás*) been pretty. I do not believe that you (*Vms.*) have (may-have) ever (*jamás*) been prudent. O-that I had (should-have) been prudent! O-that I had been frugal! O-that ya had been frugal! Thou shalt-be rewarded if thou art (shouldst-be) diligent. I-wish to-be prudent. I-wish to-be diligent. He who is a bad son, cannot be a good father. He who is impious cannot be amiable. He-pretends not to-have been deceived. He-pretends not to have been punished. Being so (*tan*) imprudent as thou art, who will-give thee money? Having been deceived by his friends, he wrote them many letters.

Remark.—The learner should now write out, for practice, the different persons of all the tenses of the various moods of the verb *ser* (omitting the nominative personal pronouns), as directed in *Remark* at the beginning of this exercise.

* *Que*, before the subjunctive mood, is generally a conjunction, meaning "*that*," as, *quiero que María sea buena*, "I wish that Mary may-be good."

† "*Es*" is here used as an impersonal verb, and means "it is."

‡ *Era*, used impersonally, meaning "it was."

§ There is no necessity for employing the pronoun "*ella*" here, as the gender of the adjective terminations indicates the gender of the nominative of the verb.

* The participle after neuter verbs must agree in gender and number with the word to which it belongs.

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FRENCH READINGS.—No. XXXI.

LE VIEUX ROI ET LA JEUNE FILLE

Section III.

Ma maîtresse est bien malade,[1] répondit la gouvernante; en disant ces mots elle se passa la main sur les yeux et essuya ses pleurs.[2]

Charlotte ajouta:

Je pourrai[a] peut-être diminuer ses souffrances,[3] et être assez heureuse pour lui rendre quelques services. Allons chez vous. Et la reine reprit la main de l'enfant.[4]

Bientôt elles arrivèrent à la maison qu'habitait l'émigrée,[5] dans le village de Kew.

Maman! maman! voilà une bien bonne dame qui vient vous voir.[6] Elle a promis de me donner tous les jours de bien belles fleurs pour vous.

A cette voix, la malade, qui était assise près de la fenêtre,[7] sur laquelle se trouvaient quelques pots de réséda, et qui, la tête appuyée sur sa main, regardait le soleil couchant, essaya de se lever;[8] mais la reine l'en empêcha avec bonté,[9] et prit[b] une chaise auprès d'elle en lui disant: Vous souffrez beaucoup, Madame? [9]

—Je n'ai plus la force de souffrir beaucoup[11] mais j'ai souffert beaucoup, répondit la veuve émigrée.

—Votre charmante enfant me l'a dit, et je viens vous proposer de changer de logement;[12] celui-ci est humide et malsain. Ici vous n'avez pas assez de soleil. J'ai une habitation tout près[13] dans le voisinage. Votre jolie petite fille y aura plus d'espace pour courir et pour jouer[14] Permettez, Madame, que je vous envoie[c] chercher demain.

Oh! j'ai peu de temps, ce n'est guère[d] la peine[15] je vous remercie,[e] Madame.

—Éloignez des pensées si sombres.[16] Pensez à votre enfant, et veuillez[f] accepter mon offre; je vous la fais de bon cœur. Je viendrai vous prendre moi-même. Mon mari et moi nous aimons beaucoup les émigrés français.[17]

—Oh! tant mieux! tant mieux![16] répétait la petite Louise. Je suis bien contente d'aller dans une grande maison avec un beau jardin.[19] Maman, vous y serez bien mieux qu'ici. Et en disant ces mots, elle baisait les mains de la dame étrangère.[20]

Le lendemain matin, une voiture vint chercher la pauvre malade.[21] Ce ne fut qu'en arrivant au pavillon de Kew,[22] que la dame française sut[g] que la reine était sa bienfaitrice.

Qui aurait jamais cru que c'était une reine![23] répétait sans cesse, dans sa joie, la vieille gouvernante; une dame en robe d'indienne et en chapeau de paille!

Les soins les plus empressés, les mieux entendus, les prévenances les plus délicates,[24] étaient prodigués à la mère de Louise, mais ils ne lui rendaient pas la santé: le chagrin avait pénétré trop profondément dans son cœur. Quant à la petite fille, elle ne pouvait croire qu'un grand jardin avec beaucoup de fleurs, un bon logement avec de bons meubles ne dussent[h] pas guérir sa mère.[25] Elle était si contente, la charmante enfant, de jouer dans la volière de la reine, et de donner à manger aux oiseaux!

Colloquial Exercise.

1. Que répondit la gouvernante?
2. Que fit-elle ensuite?
3. Qu'ajouta Charlotte?
4. Que fit alors la reine?
5. Où arrivèrent-elles bientôt?
6. Que dit alors la petite fille?
7. Où était la malade?
8. Qu'essaya-t-elle de faire?
9. La reine le lui permit-elle?
10. Que lui dit Charlotte?
11. Que répondit la malade?
12. Que proposa la reine?
13. Que dit-elle de son habitation?
14. Que dit-elle à l'égard de la petite fille?
15. Que répondit la pauvre émigrée?
16. Que lui dit la reine d'Angleterre?
17. Que dit-elle de son mari?
18. Que répétait la petite Louise?
19. Que disait-elle du jardin?
20. Que faisait-elle en disant ces mots?
21. Qu'arriva-t-il le lendemain?
22. Où la malade apprit-elle le nom de sa bienfaitrice?
23. Que répétait sans cesse la vieille gouvernante?
24. Que prodigua-t-on à la malade?
25. Que ne pouvait croire la petite fille?

Notes and References.—*a.* from *pouvoir*; L. partii., p. 100. —*b.* from *prendre*; L. part ii., p. 100.—*c.* L. part ii., § 49, R. (2).—*d.* ce n'est guère la peine, *it is hardly worth the while.*—*e.* L. S. 88, R. 2.—*f.* from *vouloir*; L. part ii., p. 100; also L. S. 69, R. 4.—*g.* from *savoir*; L. part ii., p. 104.—*h.* from *devoir.*

Section IV.

Un jour le vieux roi Georges, qui venait de[a] retomber dans un de ses sombres accès de folie, entendit chanter la jeune[b] Française.[1] Il fut frappé de la douceur de sa voix; il l'appela, et, la prenant sur ses genoux, il lui dit;

—Louise, chantez-moi ce que vous chantiez[c] tout à l'heure.[2]

—Oh! c'est bien triste, répondit l'enfant.[3]

—N'importe,[d] j'aime cet air;[4] et je serais bien aise de l'entendre encore.

Alors Louise obéit et commença cette touchante complainte sur la mort de Louis XVI.;[5]

O mon peuple! que vous ai-je fait?
J'aimais la vertu, la justice;
Votre bonheur fut mon unique objet;
Et vous me traînez au supplice!....

Pendant que la fille de l'émigrée faisait entendre ce refrain douloureux, le vieux monarque, les yeux fixés sur elle et plongé dans une sombre rêverie, laissa couler quelques larmes silencieuses.[6] Le soir, quand il fut seul chez lui, pendant qu'il n'y avait point de lumière dans sa chambre, il se mit[a] au piano et répéta l'air du Pauvre Jacques,[7] sur lequel la complainte royaliste a été composée.

Depuis ce jour il faisait souvent[f] venir la petite orpheline,[8] qui venait de perdre sa mère, et lui disait:

—Enfant, chantez l'air de Louis XVI., l'air qui me fait pleurer.[10]

Quand Louise commençait à chanter, le vieillard s'asseyait[g] à son piano-orgue, et l'accompagnait doucement[11] et avec des accords si tristes, qu'ils ressemblaient à de mélodieuses plaintes.

Ah! c'était vraiment chose touchante à voir et à entendre, que cette petite orpheline,[12] chantant, d'une voix émue, les malheurs d'un roi martyr, à un autre roi accablé sous la main de Dieu.

La reine Charlotte s'attacha de plus en plus à Louise de Glandeuil.[13] Elle avait soigné la mère jusqu'au dernier moment;[14] elle adopta l'enfant, l'éleva avec bonté, et, plus tard, l'ayant richement dotée, elle la maria avec un gentilhomme anglais.[15]

Louise vit[h] encore;[16] ses beaux cheveux noirs sont devenus blancs, et dans l'aisance et la paix que Dieu lui a données sur la terre étrangère, elle conserve religieusement le souvenir de sa pauvre mère et de ses nobles bienfaiteurs.[17] Elle a beau[i] vieillir, la mémoire du cœur ne s'éteint[j] pas en elle. Quand, il y a trois ans, je suis retourné en Angleterre, j'ai vu chez Madame Radnor, née[k] Glandeuil, un portrait de Georges III.,[18] peint dans ses plus vieux jours.

Le monarque aveugle, semble courbé sous les poids des ans et de son mal;[19] une longue barbe blanche s'épanche sur sa poitrine; sa vénérable chevelure, partagée sur le front, tombe, de gauche et de droite, sur ses épaules;[20] la tête du

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vieillard semble avoir été inclinée par le poids de sa couronne;[21] cependant, il y a encore comme un sourire errant et vague[22] sur ses lèvres. C'est peut-être un ressouvenir de la gloire de son esprit, comme un éclair au milieu des ténèbres,[23] ou comme un rayon de soleil sur un tombeau.

LE VICOMTE WALSH.

COLLOQUIAL EXERCISE.

1. Qu'arriva-t-il un jour au roi Georges?
2. Que dit-il à la petite fille?
3. Que répondit l'enfant?
4. Qu'ajouta le roi?
5. Que fit alors Louise?
6. Que faisait la roi pendant qu'elle chantait ce refrain?
7. Que fit-il le soir quand il fut seul?
8. Que faisait souvent le roi Georges depuis ce jour?
9. La mère de Louise était-elle morte?
10. Que disait le roi à la petite orpheline?
11. Que faisait le vieillard lorsqu'elle commençait à chanter?
12. Quelle réflexion l'auteur fait-il ici?
13. La reine prit-elle de l'affection pour Louise?
14. Qu'avait fait la reine?
15. Que fit-elle encore?
16. Louise existe-t-elle encore?
17. Que fait-elle dans l'aisance et la paix?
18. Qu'a vu l'auteur, il y a trois ans?
19. Comment le monarque semble-t-il?
20. Que dit l'auteur, de sa chevelure?
21. Que dit-il de la tête du roi?
22. Qu'y a-t-il encore sur ses lèvres?
23. A quoi l'auteur compare-t-il ce sourire?

NOTES AND REFERENCES.—*a.* L. S. 25, R. 2.—*b* L. part ii., § 145.—*c.* tout à l'heure, *just now*—*d.* L. S. 93, R. 1.—*e.* from *mettre;* L. part ii., p. 96.—*f.* faisait souvent venir, *often sent for.*—*g.* from *s'asseoir;* L. part ii., p. 78.—*h.* from *vivre;* L. part ii., p. 110.—*i.* L. S. 66, R. 1.—*j.* from *éteindre;* L. part ii., p. 90.—*k.* from *naître;* L. part ii., p. 96.

LA CHARITE'.

SECTION I.

DANS vos fêtes d'hiver, riches, heureux du monde,[1]
Quand le bal tournoyant[a] de ses feux vous inonde,
Quand partout, à l'entour de vos pas vous voyez
Briller et rayonner cristaux, miroirs, balustres,[2]
Candélabres ardents, cercle étoilé[b] des lustres,
Et la danse, et la joie au front des conviés;

Tandis qu'un timbre[c] d'or, sonnant dans vos demeures
Vous change en joyeux chant la voix grave des heures,[3]
Oh! songez-vous parfois que, de faim dévoré,
Peut-être un indigent, dans les carrefours sombres,
S'arrête et voit danser vos lumineuses ombres[4]
Aux vitres[d] du salon doré?

Songez-vous qu'il est là sous le givre et la neige,
Ce père sans travail que la famine assiège?[5]
Et qu'il se dit tout bas:[e] Pour un seul que de biens!
A son large festin que d'amis se[f] récrient![6]
Ce riche est bien heureux, ses enfants lui sourient!
Rien que dans leurs jouets que de pain pour les miens![7]

Et puis, à votre fête, il compare en son âme
Son foyer, où jamais ne rayonne une flamme,[8]
Ses enfants affamés, et leur mère en lambeau,[9]
Et sur un peu de paille,[10] étendue et muette,
L'aïeule, que l'hiver, hélas! a déjà faite
Assez froide pour le tombeau![11]

Car Dieu mit[g] ces degrés aux fortunes humaines,
Les uns vont tout courbés sous le fardeau des peines;[12]
Au banquet du bonheur bien peu sont conviés,[13]
Tous n'y sont point assis également à l'aise.[14]
Une loi qui d'en bas[h] semble injuste et mauvaise,
Dit aux uns: jouissez! aux autres: enviez!

Cette pensée est sombre, amère, inexorable,[15]
Et fermente en silence au cœur du misérable.[16]
Riches, heureux du jour, qu'endort[i] la volupté,
Que ce ne soit pas lui, qui des mains vous arrache
Tous ces biens superflus où son regard s'attache;—
Oh! que ce soit[k] la charité!

COLLOQUIAL EXERCISE.

1. Comment le poète appelle-t-il les riches?
2. Que voient-ils briller à l'entour de leurs pas?
3. Quel est l'effet du timbre d'or?
4. A quoi doivent songer les riches?
5. A quoi doivent-ils encore songer?
6. Que se dit le père sans travail?
7. Que dit-il des jouets des enfants des riches?
8. Que compare-t-il à la fête, en son âme?
9. Que compare-t-il encore?
10. Où l'aïeule est-elle étendue et muette?
11. Comment l'hiver l'a-t-il déjà faite?
12. Comment vont les uns?
13. Que dit le poète du banquet du bonheur?
14. Tous les conviés y sont-ils à l'aise?
15. Qu'est cette pensée?
16. Que fait-elle?
17. Comment le poète s'adresse-t-il ici aux riches?

NOTES AND REFERENCES—*a.* tournoyant, *whirling, giddy.*—*b.* cercle étoilé, *starry circle.*—*c.* timbre d'or, *golden harmony.*—*d.* vitres, *windows;* literally, *glass.*—*e.* il se dit tout bas, *he whispers to himself.*—*f.* se récrient, *applaud.*—*g.* from *mettre;* L. part ii., p. 96.—*h.* d'en bas, *from this earth;* literally, *here below.*—*i.* from *endormir;* L. part ii., p. 90.—*j.* lui, *he, the poor man.*—*k.* que ce soit, *let it be.*

ANSWERS TO CORRESPONDENTS.

YOUNG CHEMIST.—Read the Lessons on Chemistry. The writer, you will observe, is no advocate of expensive apparatus.

TOM.—Slavery was not finally abolished in the British dominions until 1838. Robert Raikes, of Gloucester, was the founder of our Sunday School system. There is a very good Reference and Circulating Library in connection with the Sunday School Union, which all teachers belonging to schools in connection with the Union are allowed the privilege of joining, on payment of the nominal sum of one shilling annually.

ECOLIER.—The letters received, both in the first and last issue of the POPULAR EDUCATOR, assure us of the excellent usage to which the publication has been applied. Thousands totally uneducated have become comparatively learned. They write to us in French, which many who have been taught French for years might envy; they show that they have studied both Latin and Mathematics with praiseworthy perseverance. The result is highly gratifying and encouraging.

F. P.—Merchant Taylors' School was founded in the year 1561, by the Merchant Taylors' Company. The school consists of about 260 boys, who are charged £10 a year. They are admitted at any age, on the nomination of one of the members of the court, who enjoy this privilege in rotation, and they are permitted to remain until the Monday after the 24th of June preceding their nineteenth birthday. Among the Grecian scholars educated at Merchant Taylors' were Bishops Andrews, Dove, and Tomson, three of the translators of the Bible; Archbishop Juxon, who attended Charles I. to the scaffold; Bishop Hopkins (of Londonderry); Archbishops Dawes, Gilbert, and Boulton; Bishop Van Mildert, and eleven other prelates; Titus Oates, who contrived the "Popish Plot;" Sir James Whitelocke, Justice of the King's Bench; Bulstrode Whitelocke, who wrote his "Memorials;" Shirley, the dramatic poet, contemporary with Massinger; Charles Wheatley, the ritualist; Neale, the historian of the Puritans; Edmund Calamy and his grandson Edmund, the Nonconformist; the great Lord Clive; Dr. Vicesimus Knox, subsequently celebrated as the head master of Tunbridge School; Dr. William Lowth, the learned classic and theologian; Nicholas Amhurst, associated with Bolingbroke and Pultenay in the *Craftsman;* Charles Mathews the elder, comedian; Lieutenant Denham, the explorer of Central Africa; and J. L. Adolphus, the barrister: also Sir John Dodson, Queen's Advocate; Sir Henry Ellis, and Samuel Birch, of the British Museum; John Gough Nichols, F.S.A., &c.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXV.

(*Continued from page* 179.)

CHEMICAL EFFECTS OF THE GALVANIC PILE OR BATTERY.

Electrolysis.—When successive discharges of electricity of high tension, as from a Leyden jar, are passed through certain compound gases, they are resolved into their elements or simpler compounds. Thus, the carbo-hydrogens are resolved into carbon and hydrogen; sulphuretted and phosphuretted hydrogen, chloro-hydric, iodo-hydric and ammoniacal gases, are respectively resolved into sulphur, phosphorus, chlorine, iodine and nitrogen on the one side, and hydrogen on the other. Carbonic acid is partly resolved into oxygen and carbonic oxide. A few solids are similarly decomposed, as oxide of mercury, chloride of silver, and even caustic potassa.

When a constant current of low tension from a galvanic battery is passed through a compound liquid, which completes the circuit, then, if the liquid be a good conductor, it remains unaltered; if it be a non-conductor, it also remains unaltered, unless the current have a high tension; but if the liquid be an imperfect conductor, it is decomposed and resolved into its elements or into simpler compounds. Gases being non-conductors, are not decomposed; solids mostly remain unchanged, because their particles are destitute of freedom of motion.

The wires or conductors from the two poles of the battery, which terminate in the liquid without contact with each other, are termed by Faraday, the *Electrodes*; that conveying the positive current being the *anode*, *zincode*, or *oxode*; and that conveying the negative current, the *kathode*, *platinode*, *chlorode*, or *hydrogode*. Such decomposition is termed *electrolysis*, and the decomposable liquid an *electrolyte*. The electro-negative body appearing at the anode, is termed an *anion*; the electro-positive body issuing at the kathode, is a *kation*; and the two together are termed *ions*. The vessel in which electrolysis is performed, is termed the *decomposing cell*.

The phenomena of decomposition are different, according to the nature of the substances decomposed, appearing as gas, as oxygen and hydrogen from water; in solid form, as silver from cyanide of silver; dissolved in the liquid, as potassa and sulphuric acid from sulphate of potassa; combined with the electrode, as fluorine from fluoride; or combining with parts of the liquid, to form secondary products.

Only such binary compounds are electrolytes as consist of one equivalent of each element, as water, the hydracids and simple metallic oxides; while sulphuric acid, sulphurous acid, and boracic acid, and the chlorides of phosphorus, sulphur, carbon, antimony, etc., although liquid, are not decomposable. A few are exceptions to this rule. It is probable that all the elements are ions. The anions are oxygen, chlorine, bromine, iodine, fluorine, and probably sulphur; the kations are hydrogen, the alkaline metals, ammonium, manganese, antimony, bismuth, zinc, cadmium, tin, lead, iron, cobalt, nickel, copper, mercury, silver, gold and platinum. In ternary compounds, salts and the acids are anions, or electro-negative, and the bases kations or electro-positive.

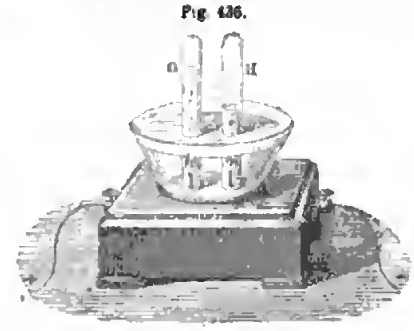
The Voltameter—Decomposition of Water.—The quantity of electricity entering an electrolyte, is in direct proportion to the ions evolved, so that the amount of the last may be employed to determine the quantity of electricity. By inserting an inverted and graduated tube filled with acidulated water in the circuit, the measured volume of oxyhydrogen gas, generated in a given time, may serve to determine the amount of electricity. Such an apparatus is termed a *voltameter*, because it is employed to *measure* the intensity of powerful currents, just as the galvanometer serves to measure that of feeble currents. Its use is founded upon the above principle discovered by Faraday, that in electro-chemical decompositions, the quantity in weight of the resolved elements is directly proportional to the quantity of electricity which passes through the current. Consequently, the volume of gases obtained may be employed to measure the chemical intensity of the current.

We have already remarked, that the chemical effects of the pile or galvanic battery depend more upon the number than the size of the couples, because, in chemical decompositions, the action of the current being exerted upon substances of feeble conductibility, it is necessary to increase the tension, and consequently the number of the couples.

The first decomposition effected by the galvanic pile or battery was that of water in 1800, by two English philosophers, Carlisle and Nicholson, with a column pile. Four or five Bunsen couples are sufficient to decompose water rapidly; but it must contain a salt or an acid in solution, because in its pure state it is much harder to decompose. Faraday says, that with a battery of 40 couples, water acidulated with sulphuric acid gives fifteen times as much hydrogen as when pure. It is also found, that a zinc copper couple excited by water, with copper electrodes, gives a stronger current through diluted sulphuric acid, than one excited by diluted sulphuric acid through water. The electrolyte is more rapidly decomposed when hot than when cold; and by heating the kathode the current is increased, which may perhaps be owing to the freer escape of gas. Water continues to decompose even under a pressure 150 times that of the atmosphere. The nature of the electrode, as well as the chemical nature of the electrolyte, influences the facility of decomposition, and it does so by adding its own attraction for the ion, which it developes from the electrolyte.

We now proceed to a description of the voltameter represented in fig. 436, merely premising that various forms of the

Fig. 436.



apparatus may be employed, according to the nature of the electrolyte and the ions. That which we have selected for illustration is employed for decomposing water and collecting the oxygen and hydrogen which are set free. It is composed of a conical glass vessel cemented to a wooden stand. From the bottom of this vessel rise two platinum wires *h* and *o*, connected with two copper adjusting screws fastened to the sides of the apparatus, and intended to receive the electrodes of the pile. After having filled the vessel with water slightly acidulated, fill two test tubes, o and H, with acidulated water, close them with the fingers, and invert them in the vessel over the platinum wires, thus establishing the current. The water immediately begins to be decomposed into oxygen and hydrogen, which escape in bubbles in the tubes. It will be observed that the positive tube contains oxygen, and the negative hydrogen. It will also be found that the volume of the hydrogen is double that of the oxygen, the relative quantities being measured by the eye, or by having the tubes graduated. This experiment, therefore, gives both the qualitative and the quantitative analysis of water.

For mixed gases or for a single gas, one tube is employed, in which one or both electrodes terminate without contact. Instead of the above arrangement, a single decomposing cell may be employed, divided by a porous diaphragm, on either side of which an electrode terminates, and allows of a separation of the ions. For the decomposition of a salt, as sulphate of soda, three cups or watch-glasses, *a*, *b* and *c*, may be employed, the three being connected by moistened asbestus fibres; *b* containing the solution of salt, *c* a solution of turmeric, and *c* a solution of litmus; the kathode terminates in *a*, and the anode in *c*. By passing a current through, the browning of the turmeric and reddening of the litmus show the passage of the alkali to the kathode *a*, and of the acid to the anode *c*.

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Decomposition of Metallic Oxides and Acids.—Electric currents exert the same action upon metallic oxides as upon water. They decompose them all, the oxygen going to the positive and the metal to the negative pole. It was by the aid of very powerful currents that Davy first decomposed potassa and soda, and referred them to the class of metallic oxides. Up to that time oxides had resisted the action of all chemical agents, and this is still the case with some, such as baryta, strontia and lime, which it has not been possible to decompose without the aid of the galvanic battery.

Oxacids are decomposed as well as oxides, and the oxygen always goes to the positive, and the base to the negative pole. Hydracids are also decomposed, but their base goes to the positive, the hydrogen to the negative pole.

In general, binary compounds are acted upon in a similar manner by the battery, one of the elements going to the positive, and the other to the negative pole. In decompositions thus effected by the battery, elementary bodies which go to the positive pole have received the name of *electro-negative* bodies, because they are regarded as naturally charged with negative electricity, and those which go to the negative pole have been called *electro-positive*, for a similar reason. Oxygen in all its combinations is constantly electro-negative, and potassium electro-positive. Other elementary bodies are sometimes electro-positive and sometimes electro-negative, according to the body with which they are combined. Sulphur, for example, which is electro-positive with oxygen, is electro-negative with hydrogen.

The following examples may illustrate variations in the decompositions. Diluted acids in general facilitate, as we have stated, the decomposition of water without being themselves decomposed. Diluted sulphurous acid gives oxygen and sulphuric acid at the positive pole, and hydrogen and sulphur at the negative pole. Strong nitric acid gives oxygen at the positive, and nitric oxide at the negative pole. Strong muriatic acid gives chlorine at the positive, and hydrogen at the negative pole; but if the anode consists of iron, copper, silver, etc., a chloride is formed and remains in solution, except chloride of silver.

Slightly moistened potassa and soda yield at a strong current oxygen at the anode, and hydrogen with potassium or sodium at the kathode; the metal hangs in drops on the platinum wire and burns. Hydrates of baryta, strontia, lime and magnesia are not decomposed, unless the kathode is dipped in mercury, when an amalgam of their metal is produced.

Solutions of alkaline chlorides, with the kathode dipped in mercury, give an amalgam at this pole and chlorine at the anode. A solution of proto-chloride of iron gives black magnetic iron at the kathode. Solutions of fluorides give at the anode fluorine, which unites with it, even if platinum be used. Sal-ammoniac solution yields chlorine at the anode, and hydrogen and ammonia at the kathode. If mercury be used at the kathode, it swells up, forming the ammoniacal amalgam.

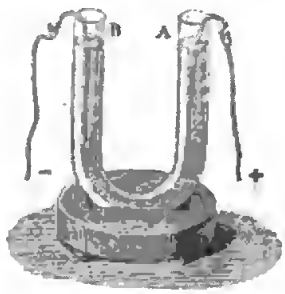
The alkaline sulphates, phosphates, and borates in solution, generally yield alkali and hydrogen at the kathode, acid and oxygen at the anode. Salts of the metals proper are usually resolved into oxygen and acid at the anode, and reduced metal at the kathode; but if the current be very strong, hydrogen also appears at the kathode. If the electrodes consist of the same metal as the base of the electrolyte, the anode is dissolved by the oxygen and acid there evolved, and an equivalent quantity deposited on the kathode. Salts of manganese, lead and silver yield hyper-oxides at the anode. In these cases there is little or no evolution of gas.

Grove says, some decompositions are effected with the feeblest currents, as iodide of potassium; while acidulated water apparently requires a current of much higher tension for decomposition. According to Jacobi, feeble currents pass through water without effecting electrolysis. Water will not conduct the electric current without decomposition. We learn from Faraday, that a single couple decomposing iodide of potassium, does not decompose water, unless nitric be added to the sulphuric acid of the couple, whereby the tension is increased. According to Matteucci, a couple of zinc and copper of about a yard square, with sulphuric acid alone, without nitric acid, decomposes nitrate of silver, so that the decomposition depends wholly on the quantity of electricity.

Decomposition of Salts.—Ternary salts in a state of solution are all decomposed by the galvanic battery, and then exhibit effects which vary with the chemical affinities and the force of the currents. If the acid and the base are stable, they are simply separated, and then the acid always goes to the positive and the oxide to the negative pole, which is the case with the sulphates, carbonates, phosphates of metals of the first two divisions. If the acid is not stable to any great degree, it is decomposed, and its oxygen alone goes to the positive pole. With a feeble oxide, the metal, being reduced, alone goes to the negative pole, while the acid and the oxygen of the oxide go to the positive pole; which is observable in the salts of lead, copper, silver, and in general in the salts of the three last divisions. When the acid and the oxide are both completely reduced, their oxygen appears entirely at the positive, and the bases at the negative pole.

The decomposition of salts is demonstrated with a bent glass tube, fig. 437, into which is poured a solution of sulphate of

Fig. 437.



potassa or soda, coloured blue with syrup of violet. Having dipped two plates of platinum into the branches of the tube, connect them with the electrodes of the battery. In the course of a few minutes—if three or four Bunsen couples are employed—the positive branch A will be seen to assume a red colour, and the negative branch B to become green, which shows that the acid of the salt is transferred to the positive pole, and the base to the negative pole, for syrup of violet is known to have the property of turning red under the action of acids, and green under that of bases.

The decomposition of salts by the battery has been applied to important purposes in the galvano-plastic art, gilding and silvering, operations which we shall describe when we come to speak of the applications of the battery.

Nobili's Rings.—In decomposing salts with the battery, Nobili obtained coloured rings of extremely brilliant tints upon metallic plates. As these rings result from very thin metallic layers deposited on the plates, their colouring is explained by the theory of Newton's coloured rings, to which we called attention when treating of Optics. To obtain them, put at the bottom of a solution of acetate of lead or sulphate of copper, a metallic plate connected with the negative pole of a feeble battery. Then close the current with a platinum wire which is connected with the positive pole, and dips into the solution perpendicularly to the plate, so as to approach very near to it. There will then be deposited opposite the point rings of a very bright colour, varying with the salt in solution and the nature of the plates.

The Lead Tree.—On plunging into a saline solution a metal more capable of oxidation than that of the salt, the metal of this latter is precipitated by that which is plunged into the solution, and is deposited slowly upon it, while the submerged metal is substituted—equivalent for equivalent—for the metal of the salt. This precipitation of one metal by another is attributed partly to chemical affinities, and partly to the electro-chemical action of a current, which would seem to be owing to the contact between the precipitating and precipitated metals; or perhaps it ought rather to be attributed to the action of the acid contained in the solution, for it has been ascertained that the solution must be slightly acid. The excess of free acid then acts upon the precipitating metal, and determines the current which decomposes the salt.

A remarkable effect of the precipitation of one metal by another is the *lead tree*, or *Saturn's tree*, as the French call it.

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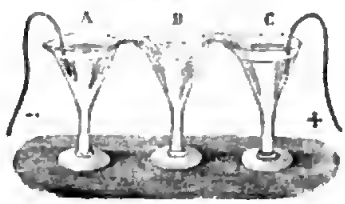
This name is given to a series of brilliant ramifications obtained by putting zinc in solutions of acetate of lead. For this purpose, fill a glass jar or bottle with a very clear solution of this salt, then close the jar or bottle with a cork, to which is attached a piece of zinc in contact with some brass wires which dip into the solution and spread out in it. The vessel being then hermetically sealed, should be left to itself. In the course of a few days bright spangles of crystallised lead are deposited upon the brass wires, and present the appearance of branches, whence the phenomenon bears the names mentioned above. The reason for calling it *Saturn's tree* is, that the ancient alchymists gave the name of Saturn to lead. The metallic deposit produced by mercury in nitrate of silver has received the name of Diana's tree.

Transferences produced by Currents.—In chemical decompositions effected by the galvanic battery, there is not only a separation of the elements, but a transference of some to the positive and others to the negative pole, as we have already intimated. This phenomenon was demonstrated by Sir Humphrey Davy by many experiments. We will content ourselves with noticing the two following:

1. Having poured a solution of sulphate of soda into two capsules connected together by means of an amianthus or hornblende match moistened with the same solution, plunge the positive electrode, or anode, in one of the capsules, and the negative electrode, or kathode, in the other. The salt is then decomposed, and at the close of a few hours all the sulphuric acid will be found in the first capsule and all the soda in the second.

2. Take three glasses A, B, C, fig. 438, the first containing

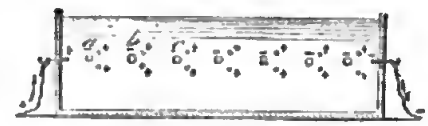
Fig. 438.



a solution of sulphate of soda, the second diluted syrup of violet, and the third pure water. Connect them together by means of moistened amianthus matches, and then pass the current from C to A, for example. The sulphate in the glass A is then decomposed, and soon the soda remains alone in this glass, which is negative, while all the acid is transferred to the glass C, which is positive. If, on the contrary, the current goes from A to C, it is the soda which goes to C, while all the acid remains in the glass A. But in both cases a remarkable phenomenon presents itself, inasmuch as the tint of the violet in the glass B, is neither made red nor green by the passage of the acid or the base through it. This singular circumstance has not yet been satisfactorily explained.

Grotthuss's Hypothesis on Electro-chemical Decompositions.—Grotthuss has propounded the following theory with regard to electro-chemical decompositions effected by the galvanic battery. Starting with the hypothesis, that in every binary compound, or substance behaving as such, one of the elements is electro-positive and the other electro-negative, according to what has been before stated, this philosopher holds, that under the influence of the contrary electricities of the electrodes of the pile, a series of successive decompositions and recompositions is produced in the liquid into which they are plunged, so that only the elements of the extreme molecules do not recombine, and these being free, go to the poles. Water, for example, being formed of one atom of oxygen and two atoms of hydrogen, and the first gas being electro-negative and the second electro-positive, when this liquid is traversed by a sufficiently powerful current, the molecule *a* in contact with the positive pole, settles in the position indicated in fig. 439, that is to say, the oxygen is attracted and the hydrogen repelled. The oxygen of this molecule then going to the positive electrode, the hydrogen which is set at liberty immediately unites with the oxygen of the molecule *b*, then the hydrogen of this with the oxygen of the molecule *c*, and so on, up to the negative pole, where the last atoms of hydrogen are set at liberty and go to the pole. The same theory applies to metallic oxides and salts, and explains, he thinks, how it is that in the experiment described in the preceding paragraph, the syrup of violet in the vessel B neither becomes red nor green.

Fig. 439.



Law of Chemical Decompositions by the Galvanic Battery.—Our illustrious countryman, Faraday, was the first to make known the following remarkable law of decompositions by the galvanic battery. *When the same current acts successively upon a series of solutions, the weights of the elements resolved are in the same ratio as their chemical equivalents.* The experiments which led him to the discovery of this law, were made with voltameters connected together by platinum wires and traversed by the same current. It was thus found that with saline solutions of different metals, the quantities of metal deposited on the negative wires in the voltameters, were respectively proportional to the equivalents of these metals.

The quantity of a body decomposed, says Faraday, is equivalent to the quantity of the body which, by its chemical action, produces the galvanic current; or rather, it approaches so closely to this proportion, that the variation may be attributed to imperfection of the apparatus. For every 9 pints (= 1 equiv.) of water decomposed in the voltameter, a little more than 32·2 pints (= 1 equiv.) of zinc are dissolved in each cell of the battery.

Electric Polarity.—This name is applied to a peculiar property acquired by plates of platinum which have served to transmit the current through a decomposable liquid. This property, which was pointed out by M. De la Rive, consists in this, that when they are taken from the solution and plunged in pure water, they give rise to a current of a contrary direction to that which they have served to transmit, as is proved by bringing them into contact with the ends of the wire of a galvanometer. The secondary current thus developed is more intense in proportion to the length of time during which the action of the first current has been continued.

M. Becquerel has explained the polarity acquired by metals, by showing that it arises from the fact, that, in the decomposition of salts, a layer of acid attaches to the plate which plays the part of a positive electrode, and a layer of the base to that which acts as a negative pole; for it is sufficient to plunge two plates of platinum, the one into an acid, and the other into an alkaline solution, in order that the plates may acquire polarity.

Plates of platinum which have served for the decomposition of pure water, thus acquire electric polarity without our being able to attribute it to the effect of an acid or a base; but M. Matteucci has shown that it arises from the oxygen and the hydrogen which adhere to each plate respectively.

LESSONS IN MORAL SCIENCE.—No. X.

THE AUTHOR OF OUR BEING CONSIDERED IN RELATION TO MORAL SCIENCE.

It has already been intimated, that the very existence of conscience seems to indicate, that man has a Superior to whom he is amenable for his conduct. The feeling of moral obligation which accompanies every perception of right and wrong, seems to imply that man is under law; for what is moral obligation but a moral law? And if we are under a law there must be a lawgiver, a moral governor, who has incorporated the elements of his law into our very constitution. This argument for the existence of God is solid, and independent of all other arguments: and it goes further than arguments derived from the evidences of design, which abound in the world around us; for these prove no more than that the Author of our being is intelligent, but this argument proves that he is a moral Being, and exercises a moral government over us. The atheist, when

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he feels, as he must, remorse for some great crime, can scarcely help believing that there is a God who is displeased with his wicked conduct, and who will punish him hereafter; for the keen anguish of remorse seems to point to a punishment which is future. Hence it is, that when atheists come into those circumstances which have a tendency to awaken the conscience, they for the time become believers in the existence of God. Thus in a storm at sea, even the most confirmed atheist has been found calling upon God for deliverance; and when death is suddenly presented to them, they often find that their atheistical theories cannot withstand the power of an awakened conscience. Certainly the existence of an accusing conscience cannot in any way be so well accounted for, as by the supposition that man is the creature of a Being who intended to form him in such a manner, that he should have a control over his actions, and who has left an indelible proof of his authority in the mind of every man.

But omitting to press this argument further at present, let us attend to some of the other evidences of the existence of a God. No one can contend, that there is anything absurd in the idea of an eternal, all-powerful, intelligent First Cause, from whom all things have received their being. No one can doubt, that the supposition of the existence of such a Being seems to account for the phenomena of nature; and it is equally certain, that they cannot be rationally accounted for on any other hypothesis.

To deny that in animals and vegetables there are evident marks of design, would be as unreasonable as to deny that anything exists. Thus the eye was formed to see, the ear to hear, the mouth to masticate our food, the stomach to digest it, the various internal organs to separate the particles suited for nutrition from the mass, and by a wonderful and inexplicable process to convert or assimilate these particles into the various forms and organs which constitute the human body. For any man to affirm, that in all these contrivances and operations there is no evidence of design, is certainly to contradict the intimate conviction of his own reason. It may on many accounts be expedient and highly profitable to accumulate arguments from design, as manifested in the rational, animal, vegetable and mineral world; but for mere argument and demonstration these details are unnecessary. A man cast away on a desolate shore would be as certain that some rational beings had been there, if he found one watch, or one quadrant, as if he should see a thousand of such like or other works of art strewed along the shore. His mind is soon satisfied with the force of this evidence, as observed in a few particulars, and the conviction of the truth, that these things are the effect of a designing cause, is as perfect as it can be by the contemplation of ever so many instances. It may, we think, be taken for granted, and even atheists will admit, that we cannot conceive of any works, or contrivances, which would more clearly evince design than those which are found in the human and other animal bodies. Though it is said that some ancient atheists attributed every thing to chance, yet it seems unnecessary to take up much time in combating such a theory. Atheists no longer resort to this very absurd notion. As then design manifest in any effect, leads necessarily to the conclusion, that intelligence exists in the cause, there is no escape from the conclusion, that the cause of the existence of animals and vegetables is a wise and powerful Being, but by one of the following suppositions. 1. That every thing in which design is manifest has existed from eternity; or, 2. That there are in the material universe causes possessing power and intelligence to produce these effects, but no one great intelligent person; or, 3. That there has existed from eternity a succession of these organised beings, producing one another in a continued series; so that while the individuals in the series perish, the succession is eternal.

The first supposition is too extravagant, we should think, to have any advocates. Indeed, as it relates to the bodies of animals and vegetables, we have a certain demonstration, that their organisation has a beginning. And if every thing was from eternity, every thing would be immutable and imperishable; but we see every kind of organised bodies tending quickly to destruction. Our souls also had a beginning, for their gradual increase and development is a matter of daily observation. We have no remembrance of an eternal existence, nor any consciousness of independence which must be an attendant of an eternal being. We are conscious that we cannot cease to be, nor control our own destiny. Nothing is more certain in the mind of all thinking men, than that we who now live are creatures of yesterday. But it is unnecessary to refute an error which perhaps no one is so unreasonable as to hold.

Let us then consider that atheistical, or rather pantheistical scheme, which attributes all the appearances of design in the world to the world itself; that is, to certain causes existing in the world which produce beings of various species, not by creation out of nothing, which they hold to be impossible, but by an evolution or development of principles contained in the world itself. According to this theory, the world is God, and all things are parts of this one being.

This theory would avoid the name of atheism, which has ever been odious; but it retains the virus of the poison of atheism under another name. It admits a cause, or rather multitude of causes, capable of producing these marks of design; but denies that this cause, considered as one or many, is a person. The question necessary to be determined is, What is necessary to constitute a person? Here we have intelligence in the cause, in the highest conceivable degree. But the structure of the body of man is not mere intelligence; there is an adaptation of means to an end. This supposes the exercise of choice or selection, which is obviously an exercise of will. Every instance of contrivance therefore evinces the exercise of an intellect and will; and that being in which these two properties are found, we are accustomed to denominate a person.

It would be difficult to find a better definition of a person. But we need not dispute about the name; when there is manifest evidence of wise contrivance in the effect, there must be an intelligent cause to produce such an effect. Where, we ask, is that cause? Is it in the individual which exhibits these signs of design? That would be to make the same thing cause and effect. Is there then for each individual in which wise contrivance appears a particular cause; or is nature or the world to be considered one general cause, operating in a multitude of ways? To suppose a particular cause for every one of these effects, would be to multiply deities beyond the wildest mythology of the heathen; for these causes being intelligent beings, possessing a wisdom beyond our conception, each is properly considered a separate deity. But even this supposition comes utterly short of furnishing a satisfactory account of the phenomena of the universe; for the admirable contrivances in the natural world consist very often in the adaptation of things which are entirely distinct to each other, as of the light to the eye, the air to the ear and to the lungs, the food to the stomachs of the various species of animals, etc. The same adaptation is equally obvious in the vegetable world. That cause, therefore, which produced the eye must have produced the light; and the cause of the curiously-contrived apparatus of hearing must have formed the air; and the author of the stomach must have adapted it to various kinds of food, etc. The hypothesis of an infinite number of separate intelligent causes cannot be maintained. All these effects must be attributed to one cause, and that cause must be infinitely wise and powerful, to give existence to so many wonderful works.

If, then, there is one cause of all these different species of beings, which could not exist without wise contrivance, that cause must be powerful, intelligent and benevolent; but power, wisdom and intelligence can exist only in some being, and that being which possesses them must be a person. The pantheist will allege, that these attributes belong to the universe itself, and therefore there is no need to suppose any being to exist separate from, and independent of, the world. All these phenomena arising, are only the developments of this one substance, in which the attributes before mentioned have their seat.

Before we receive such an opinion, let us inquire what constitutes the universe, as far as our knowledge can extend. We become acquainted with the world without us by our senses. Trusting to the information of these inlets of knowledge, we find that the universe consists, as far as known to the senses, of peculiar objects combined together in various ways. These material things, though subject to peculiar laws, appear entirely destitute of intelligence. In this all men agree. The light, the air, the water, the rocks, the earth, the metals, etc., are not capable of thought. Indeed every material thing with which we are acquainted consists of an

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infinite number of parts, even when of the same kind, and no otherwise related to each other than that they are situated near to each other; whether they are at all in contact we do not know. If thought belonged to matter, each of these infinitesimal particles of matter would be a conscious being, and his consciousness be independent of every other particle. By what medium of communication could these particles of matter agree on forming an organised body? But the pantheist does not believe that matter is endued with thought. His theory is, that in the world there exists not only external substance, but thought or intelligence in the same substance. But as this intelligence must have a subject in which it resides, and of which it is a quality, and as it cannot be an attribute of brute matter, there must exist a substance distinct from matter, of which it is a property. Matter being divisible, inert and extended, cannot have intelligence as an attribute, which is active, indivisible, and unextended. Extension and thought, therefore, cannot be properties of the same substance. If, then, the cause of the phenomena of nature which indicate design is in the world itself, the world must, besides the gross matter which we see and feel, be possessed of a soul, or spiritual substance, in which this intelligence resides. This would bring us to the old Pagan theory of the *Soul of the World*. Under the material part, but under this only, there is a spiritual substance, a soul; just as in a man, we can see and feel the body, but we know that within this case there exists a spiritual substance or soul. This theory, then, admits the existence of a great spirit, possessing the attributes necessary to account for all the appearances of wisdom in the world. It differs from the common theistical doctrine only in this, that it would confine this being to the world; but for this there could be assigned no valid reason. A being possessing such power over matter as to mould it into every organised form found in animals, vegetables and minerals, must have a complete control over matter, and be perfectly acquainted with all its most hidden properties and capabilities, and must be independent of matter, and must exist every where, to carry on the processes of nature. And as we do not know the extent of the material universe, we can set no limits to the presence of this spiritual, intelligent and omnipotent being. The object of pantheism is to get clear of the idea of a personal God, who gives laws to creatures, and superintends and governs them according to their natures. But the hypothesis, if it could be established, does not answer the purpose for which it was devised. Still, even according to the hypothesis, we must have a personal God, who knows all things and rules over all.

The only other atheistical method of accounting for the phenomena of the world, as indicating the most consummate wisdom, as well as the most omnipotent power, is the hypothesis, that the universe in its present form has existed from eternity, and that all the various species of animals and vegetables now observed have always existed, and have communicated existence to one another in an endless series. And as an eternal series has no beginning, it can have no cause. There is therefore no need of supposing any first cause, from whom every thing has proceeded. As we must suppose some being to exist from eternity, we may as well suppose that the world which we see is that eternal being.

This has always been the stronghold of atheism, and therefore deserves a more special attention. The only circumstance, however, which gives an advantage to this theory is, that it carries us back into the unfathomable depths of eternity, where our minds are confounded by the incomprehensibility of the subject. It is also to be regretted that some truly great men, in attempting to refute this theory, have adopted a mode of reasoning which is not satisfactory. This, we think, is true with respect to Bentley, who possessed a gigantic intellect; and, as might have been expected, many are his followers. Dr. Samuel Clarke has also pursued a course in his reasoning on this point which, to say the least, is not entirely free from objection. The same may be said of many others, and especially of some, including the celebrated Stapfer, who have attempted a mathematical demonstration of the falsehood of an infinite series of living organised beings.

It will be an object, therefore, to free the subject as much as possible from intricacy and obscurity, and to present arguments which shall be level to any common capacity accustomed to attend to a train of reasoning. We may certainly assume it as an admitted principle, that every effect must have not only a cause, but an adequate cause. If wise contrivance and evident adaptation of means to an end be found in the effect, to ascribe it to an unintelligent cause is as unsatisfactory as to assign no cause.

This, then, being assumed, we would take this position as incontrovertible, that if design manifest in one effect requires an intelligent cause, the same necessity requires the same kind of a cause for any number of similar effects; and the conclusion must be the same, whether the number is finite or infinite. This evident truth has been often and happily illustrated, by supposing a chain suspended before our eyes, but reaching beyond the sphere of our vision. The lowest link requires a support, and so does the second, and there is no less need of support for every successive link as you ascend the chain; and if you suppose as many links beyond your sight as there are atoms in the universe, still the same necessity of a support is presumed to exist. There must ultimately be a support for all these suspended links. But suppose some one to allege that the chain is of infinite length, and has no beginning, we immediately begin to experience some confusion of ideas. We attempt to grasp infinity, and finding ourselves baffled in the attempt, we are apt to lose sight of the proper logical conclusion in this case. The necessity of a supporting power has no dependence on the number to be sustained. If one, if one hundred, if one thousand require support, so do any number of links. The conclusion is not in the smallest degree affected by the number, except that the more links, the stronger must be the supporting power; but this has nothing to do with our present argument. The conclusion will be of the same kind, and will as necessarily follow, in the case of effects which have in them the marks of design. The number cannot affect the conclusion. If one such effect cannot exist without an intelligent contriver, an infinite number of great effects cannot. If multiplying one cipher, or zero, by any number in arithmetic, produces nothing, and the same is the result of multiplying a thousand ciphers, the conclusion is inevitable, that an infinite number of ciphers multiplied by any number cannot result in any positive quantity. Indeed, if all the individuals in the supposed infinite series are of the same kind, all are effects, and it is absurd to conceive of an effect without a cause. Cause and effect are correlative and imply each other; and if an effect cannot exist without a cause, much less can an infinite number of effects exist without an adequate cause.

Our next argument will leave out of view altogether the idea of infinity, which is so apt to confound the mind. It is this. Every effect must not only have a cause, but that cause must be in existence and operation; for it would be absurd to think of a cause operating, when it no longer had an active existence. Let us, then, take that individual of a series of organised beings which came last into existence. Let it be an animal—a dog or horse. This individual we know came recently into being; when produced there must have been an adequate cause in existence and in operation. What was that cause? The hypothesis confines us to the preceding series of animals of the same species, supposed to have come down in uninterrupted succession from eternity. But whether the series be long or short, finite or infinite, is of no consequence as it relates to our present argument. What we are inquiring after is a cause in existence at the time this curiously organised and animated being came into existence. Now at that time the individuals of the series had all ceased to exist, except the immediate progenitors. Whatever cause existed, cannot therefore be looked for in them; and if the effect is such as manifestly to be beyond any power and skill which they possessed, the contriving and efficient cause cannot be found in the series. There must be a higher cause.

But lest some persons should have a vague notion that some hidden power might be communicated through the series, although not found in the progenitors of the animal under consideration, we will lay down a principle which is admitted in mechanical powers, and is equally applicable to all causes. It is this. In all cases where any power is communicated through a series of individuals, the whole power necessary to produce the effect, must not only be communicated to the first, but to every single thing in the series, until it reach the last, which is intended to be affected by the original power.

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Thus, suppose it to be required to communicate motion to a ball on a plane, by sending an impulse through a hundred balls, the principle known to all mechanicians is, that the force necessary to give the desired motion must be communicated to the first, and from the first to the second, and so on, until it reaches the ball intended to be moved. And this principle is equally applicable to all causes which operate through a succession of particulars. If at the commencement of a series, an intelligent cause operated, and then ceased, or stopped short of the last effect, no sign of intelligence could exist in this, which brings us back to the same obvious principle with which we commenced, viz. that when any effect is produced, an adequate cause must exist, and be in operation at the time of its production. The simple inquiry, then, is, had the progenitors of this dog, or horse, when the animal came into existence and became animated, the skill necessary to continue the animal frame, with all its curiously contrived parts, and power and skill to give to this individual that constitution of instincts, appetites and passions suited to its condition in the world, which it possesses? I leave the atheist to answer this question. The same course of reasoning will be equally forcible as applied to fruits and vegetables. Every one of these organised beings furnishes an irrefragable argument for the being of a God; for in any one of these is evidence of the existence of a wisdom and a power which certainly do not exist in the several particulars of which the series consists.

The only modern attempt to invalidate the argument for the being of God founded on the appearance of design in the universe, is that of Mr. Hume, which is substantially this: that this argument supposes that we have seen similar works performed, from which, by analogy, we conclude that an intelligent cause is necessary to account for them; as if we find a watch we believe it to have been made by an artist, because we have before observed such works made by skilful men; but in relation to the world, it is a singular work, entirely unique. We have never seen any world produced, and, therefore, the reasoning which would hold in regard to the conclusion that the watch was made by an artist does not apply.

More importance has been given to this objection, especially by Dr. Chalmers, than it deserves. The objection of Hume is a mere sophism, and can unsettle no mind which understands the nature of the argument in question. According to Mr. Hume's argument we could not infer from any work of art that it had an intelligent author, unless we had seen a work of the very same kind by an artist. Suppose a boy who has never been away from his father's farm, where he has seen nothing superior to ploughs, carts, and harrows, to be conducted to a seaport, and to see a steam-frigate. As he has never seen on the farm any thing formed like this, according to Mr. Hume, he could not infer that this stupendous work was produced by an intelligent cause. To the boy it would be a singular effect, the like of which he had never witnessed, and, therefore, he could infer nothing respecting it. Now every child knows better than this. Any boy of common sense will conclude in a moment that this steam-vessel must have been the work of a skilful artificer.

In order to apply the argument from design to any effect, it is not at all necessary that we should have seen an artist engaged in producing its like. All that is necessary is, that there should immediately appear an adaptation of means to produce a certain end; and it matters not as to the argument whether we ever conceived of a similar work, or knew any thing of the artist; the certain appearance of design, or a skilful adaptation of means to an end, is always sufficient to produce the certain conclusion, that there has been a designing cause at work. The works of nature are not a singular effect, as far as the argument *a posteriori* is concerned. The adaptation of means to an end in these is similar to the works of design among man. The difference between a telescope and the eye of an animal is not so great as between a plough and a steam-engine. If there was any difference between the inference from seeing a steam-frigate or complicated spinning-machine, which has never been seen before, and another plough or cart, it would be in favour of the contrivance not before witnessed. The argument seems to be *a fortiori* in this case. And as the whole argument in regard to the works of man is founded simply on observing an adaptation of means to accomplish an end, and not the adaptation to produce some particular end which we had before seen effected by similar means; and as the adaptation of means to an end is as evident in the works of nature as in the works of man, the argument is as conclusive in one case as in the other.

LESSONS IN ARITHMETIC.—No. XXXV.

TABLE,

Showing the amount of £1 at 3, 4, 5, 6, and 7 per cent. compound interest, for any number of years from 1 to 40.

Yrs.	3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 per cent.
1	1·030,000	1·040,000	1·050,000	1·060,000	1·07,000
2	1·060,900	1·081,600	1·102,500	1·123,600	1·14,490
3	1 092,727	1·124,864	1·157,625	1·101,010	1·22,504
4	1·125,509	1·169,859	1·215,506	1·262,477	1 31,079
5	1·159,274	1·216,653	1·276,282	1·338,226	1·40,255
6	1·194,052	1·265,319	1 340,096	1·416,519	1·50,073
7	1·229,874	1·315,932	1·407,100	1·503,630	1·60,578
8	1·266,770	1·366,569	1·477,455	1·693,846	1·71,816
9	1·304,773	1·423,312	1·551,328	1·689,479	1·83,845
10	1·343,916	1·480,244	1 028,805	1·790,846	1·96,715
11	1·384,234	1·539,454	1·710,339	1·898,299	2·10,485
12	1·425,761	1·601,032	1·705,856	2·012,196	2 25,219
13	1·468,534	1·665,074	1·885,649	2·132,928	2·40,984
14	1·512,590	1·731,676	1·979,932	2·260,004	2·57,853
15	1·557,967	1·800,044	2·078,028	2·396,558	2·75,903
16	1·604,706	1·872,981	2·182,875	2·540,352	2 95,210
17	1·652,848	1 947,900	2·292,016	2·692,773	6·15,881
18	1·702,433	2·025,817	2·406,619	2·854,339	6·37,203
19	1·753,506	2 106,849	2·526,950	3 025,600	3·01,652
20	1·806,111	2·101,123	2 653,296	3·207,135	3·86,068
21	1·860,295	2·278,768	2·785,063	3·399,564	4·14,056
22	1·916,103	2·369,910	2·925,261	3·603,537	4·43,040
23	1·073,587	2·464,710	6 071,524	3·819,750	4·74,052
24	2·032,794	2·563,304	3·225,100	4 046,965	5·07,236
25	2·093,778	2 665,836	3·386,655	4·291,871	5·42,743
26	2·156,592	2·772,470	3·555,673	4 549,383	5 80,735
27	2·221,289	2·883,369	3·733,456	4·822,346	6·21,386
28	2·287,928	2 098,703	3·920,129	5·111,687	6·64,883
29	2 356,566	3·118,651	4·116,136	5·418,686	7·11,425
30	2·427,262	3·243,398	4·321,942	5·743,491	7·61,225
31	2·500,080	3·373,133	4·538,039	6·086,101	8·14,571
32	2·575,083	3·508,059	4·764,941	0·453,386	6·71,527
63	2·652,335	3·648,381	5·003,189	6·840,590	9 32,533
34	2·731,005	3·704,316	5 253,348	7·251,026	9·97,811
35	2·813,802	3 946,089	5 516,015	7 686,087	10 6,706
36	2·898,278	4·103,933	5·791,810	8·147,252	11·4,239
37	2·985,227	4·268,090	6 081,407	8·030,087	12·2,230
38	3·074,783	4·438,813	6·385,477	9·154,252	13 0,792
39	3·167,027	4·616,366	6·704,751	0 703,507	13·9,948
40	3·262,038	4·801,021	7·030,989	10·28,572	14·9,744

DISCOUNT.

Discount is the *abatement* or *deduction* made for the payment of money before it is *due*. For example, If I owe a man £100, payable in one year without interest, the *present worth* of the sum is less than £100; for, if £100 were put out to interest for 1 year at 0 per cent., it would amount to £106; at 7 per cent., to £107, etc. In consideration, therefore, of the *present payment* of the sum, justice requires that my creditors should make some *abatement* from it. This abatement is called *Discount*.

The *present worth* of a debt payable at some future time without interest, is that sum which, being put out to legal interest, *will amount to the debt*, at the time it becomes due.

Ex. 1. What is the present worth of £756, payable in 1 year and 4 months, without interest, when money is worth 6 per cent. per annum?

Analysis.—The *amount*, we have seen, is the sum of the principal and interest. Now the amount of £1 for 1 year and 4 months, at 6 per cent., is £1·06; that is, the amount is $\frac{106}{100}$ of the principal £1. The question then resolves itself into this: £756 is $\frac{106}{100}$ of what principal? If £756 is $\frac{106}{100}$ of a certain sum, $\frac{1}{106}$ is $\frac{1}{106}$ of £756; now £756 ÷ 106 = £7, and $\frac{100}{100}$ = £7 × 100, which is £700.

Or we may reason thus: Since £1·08 (amount) requires £1 principal for the given time, £756 (amount) will require as many pounds as £1·08 is contained times in £756; and £756 ÷ £1·08 = £700, the same as before.

Proof.—£700 × ·08 = £56, interest for 1 year and 4 months; and £700 + 56 = £756, the sum whose present worth is required. Hence,

To find the *present worth* of any sum, payable at a future time without interest.

First find the amount of £1 for the time, at the given rate, as in simple interest; then divide the given sum by this amount, and the quotient will be the present worth.

The present worth subtracted from the debt will give the true discount.

This process is often classed among the problems of interest, in which the amount (which answers to the given sum or debt), the rate per cent., and the time are given, to find the *principal*, which answers to the *present worth*.

2. What is the present worth of £424·83, payable in 4 months, when money is worth 6 per cent.? What is the true discount?

Solution.—£424·83 ÷ £1·02 = £416·50 = £416 10s., present worth; and £424·83 − £416 50 = £8·33 = £8 6s. 7½d., the true discount.

3. What is the present worth of £1,000, payable in 1 year, when the rate of interest is 5 per cent.?

4. What is the present worth of £1,645, payable in 1 year and 6 months, when the rate of interest is 5 per cent.?

5. What is the true discount on a bill for £2,300, payable in 6 months, when the rate of interest is 5 per cent.?

6. What is the true discount, at 6 per cent, on £4,260, payable in 4 months?

7. What is the present worth of a bill for £4,800, due in 3 months, when the rate of interest is 6 per cent.?

8. What is the present worth of a bill for £6240, payable in 1 month, when the rate of interest is 4 per cent.?

9. A man sold his farm for £3,915, payable in 2½ years: what is the present worth of the debt, at 6 per cent. discount?

10. What is the present worth of a bill for £10,000, payable at 30 days' sight, when interest is 5 per cent. per annum?

11. What is the difference between the true discount of £8,000 for 1 year, and the interest of £8,000 for 1 year, at 5 per cent.?

BANK DISCOUNT.

Case I.

12. What is the discount on a bill for £850 for 6 months, at 5 per cent.? What is the present worth of the bill?

Operation.

£850				days	days.	£	s.	d.
5				365	: 3 ::	42	10	0
							20	
100)42·50								
20							850	
							3	
10·00								
						365)2550(6s.		
						2190		
£	s.	d.						
2)42	10	0	Disct	for 1 year.			360	
							12	
21	5	0		„	6 mos.			
0	6	11½		„	3 days.		4320(11*d*.	
							4015	
21	11	11½	Total discount.					
							305	61
£	s	d.					=	—
850	0	0					365	73
21	11	11½						
828	8	0½	Present worth.					

It is customary for *banks* and *bill-brokers*, in discounting a bill or promissory note, to deduct in advance the *legal interest* on the given sum from the time it is discounted to the time it becomes due. Hence, in ordinary business transactions, *discount* is the same as simple interest paid *in advance*. Thus, the *usual discount* on a bill for £105, payable in 1 year, at 5 per cent., is £5 5s., while the *true discount* is only £5.

The difference between *ordinary discount* and *true discount*, is the interest of the true discount for the given time. On small sums for a short period this difference is trifling, but when the sum is large, and the time for which it is discounted is long, the difference is worthy of notice. Ordinary discount is always supposed to be meant, unless the word "*true*" is prefixed.

It is usual to charge interest for the 3 days' grace.

To find the discount on a bill or promissory note.

Calculate the interest of the bill or promissory note for three days more than the specified time, and the result will be the discount.

The discount subtracted from the sum named in the bill or note will give the present worth required.

Note.—Interest should be computed for the *three days' grace* in each of the following examples.

13. What is the discount on a bill for £465, payable in 6 months, at 6 per cent.?

14. What is the discount on a bill for £972, payable in 4 months, at 5 per cent.?

15. What is the discount on a bill for £1,492, payable in 3 months, at 7 per cent.?

16. What is the discount on a bill for £628, payable at 60 days' sight, at 5 per cent.?

17. What is the present worth of £2,135, payable in 8 months, at 7 per cent.?

18. What is the present worth of a bill for £2,790, payable in 1 month, discounted at 6 per cent. at a bank?

19. What is the discount, at 5½ per cent., on a bill for £1,747, payable at 90 days' sight?

20. What is the discount, at 4½ per cent., on a bill for £3,143, payable in 4 months?

21. What is the discount on £5,126, payable in 30 days, at 8 per cent.

22. What is the discount on £3,841, payable in 60 days, at 6½ per cent.?

23. What is the present worth of a bill for £6,721, payable in 10 months, discounted at 6 per cent. at a bank?

24. What is the present worth of a bill for £1,800, payable in 12 days, at 7 per cent. discount?

25. What is the discount on £10,000, payable in 45 days, at 6 per cent.?

26. What is the discount on £25,260, payable in 90 days, at 7 per cent.?

27. What is the difference between the true discount and ordinary discount on £5,000 for 10 years, at 6 per cent.?

Case II.

28. A man wishes to make a bill payable in 1 year, at 6 per cent., the present worth of which, if discounted at a bank, shall be just £200: for what sum must the note be made?

Analysis.—The present worth of £1, payable in 1 year, at 6 per cent. discount, is £1 − £$\frac{6}{100}$ = £$\frac{94}{100}$; that is, the present worth is $\frac{94}{100}$ of the principal or sum discounted. The question then resolves itself into this: £200 (present worth) is $\frac{94}{100}$ of what sum? Now, if £200 is $\frac{94}{100}$ of a certain sum, $\frac{1}{100}$ is $\frac{1}{94}$ of £200; and £200 ÷ 94 = £2·12766, and $\frac{100}{100}$ = £2·12766 × 100, which is £212·766 = £212 15s. 3$\frac{2}{10}$d. *Ans.*

Or we may reason thus: Since £$\frac{94}{100}$ present worth requires £1 principal or sum to be discounted for the given time, £200 present worth will require as many pounds as £$\frac{94}{100}$ is contained times in £200; and £200 ÷ £ 94 = £212·766, or £212 15s. 3$\frac{2}{10}$d.

Proof.—£212·766 × ·06 = £12·7659, the discount for 1 year 1 and £212·766 − £12·7659 = £200, the given sum Hence,

To find what sum, payable in a specified time, will produce a given amount, when discounted at a bank, at a given per cent.!

Divide the given amount to be raised by the present worth of £1, for the time, at the given rate of bank discount, and the quotient will be the sum required to be discounted.

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29. How largo must I maka e bill, payable in 6 months, to raise £409, when discounted at 7 per cent. discount?

30. What sum, payable in 4 months, must be discounted at e bank, at 5 per cent., to produce £950?

31. What sum, payable in 60 days, will produce £1,238, if discounted at a bank, at 8 per cent.?

32. For what eum must e bill be drawn, payable in 34 days, the proceeds of which, at 6 per cent. hank disconnt, will be £2,500?

33. For whet sum must a bill be drawn, payable in 90 days, so that the proceeds, at 7 per cent. bank discount, may be £3,755?

34. A men bought e farm for £4,266 cash: how large a bill, payable in 4 months, must he taka to a bank to raise the money at 6 par cent. discount?

35. A man wishes to obtain £6,324 from a bank at 8 per cent. discount: how large must he make his note, payable in 1 month and 16 days?

36. Whet sum, payable in 6 months, if discounted at a bank, at 6 per cent., will produce £1,000?

37. What sum, payable in 4 months, will produce £5,000, if discounted at 7 per cent. at e bank?

38. A man received £4,825 as the proceeds of a bill, payable in 60 days, discounted at e hank at 6 per cent.: what was the amount of the note?

39. A merchant wished to pey e debt of £8,248 et e bank, by getting a bill payabla in 30 days discounted, et 6 per cent.: how large must he make tho bill?

INSURANCE.

Insurance is *security* against *loss* or *damage* of property by fire, atorms et sea, end other casualties. This security is usually effected by contract with insurance companies, who, for a stipulated sum, agree to restore to the owners the amount insured on their houses, ships, and other property, if destroyed or injured during tho specified time of insurance.

Insurence on ehips and other property et sea is sometimes effected by contract with individuals.

Tho insurers, whether an incorporated company or individuals, are often termed *underwriters*.

The *written instrument* or *contract* is called the *policy*.

The *sum* paid for insurance is called the *premium*.

The premium paid is e *certain percentage* on the emount of property insured for 1 year, or during e voyage et sea, or other specified time of risk.

Rates of insurance on dwelling-houses and furniture, stores and goods, ehops, manufactories, etc., vary from ¼ to 2 per cent. per annum on tha sum insured, according to the exposure of the property and the difficulty of moving the goods in case of casualty. It is a rula with most insurance companies not to insure more then *two-thirds* of the velue of e building or goods on land.

Coasting vessels are commonly insured by the season or year. In time of peace, the rete varies from 4 to 7½ per cent. per annum; in time of war it is much higher. Whale ships are generally insured for tha voyage, et a rate varying from 6 to 8 per cent. on the sum insured.

Whan the general averaga of loss is *less* than 5 per cent., the underwriters are not lieble for its peyment.

Case I.

To compute Insurance for 1 year, or a specified time.

Multiply the sum insured by the given rate per cent., as in interest.

Ex. 1. A man effected en insurance on his house for £1,500, et 1¼ per cent. per annum: how much premium did he pay?

Solution.—£1500 × ·0125 (the rate) = £18·75. *Ans.*

2. What is the premium for insuring e store to tha amount of £2,760, at ¾ per cent.?

3. What premium must I pay for insuring e quantity of goods, worth £6,280, from Liverpool to New York, et 1½ per cent.?

4. Whet is the annual premium for insuring a stock of goods, worth £10,200, et ¾ per cent.?

5. What is tho annual premium for insuring a coasting vessel, worth £1,600, et 6½ per cent.?

6. A bookseller shipped e quantity of books, valued at €4,700, from Loudon to Dublin, at 1½ per cent. insurance: what amount of premium did he pay?

7. A merchant shipped e cergo of flour, worth £4,500, from Liverpool to New York, et 2 per cent.: how much premium did he pay?

6. What is the insurance on e cargo of teas, worth £7,600, from Canton to Loudon, et 2½ per cent.?

9. What is the annual insurance on a factory, worth £6,500, et ¾ per cent.?

10. A powder mill was insured for £1,945, at 12½ per cent.: what was the annual premium?

11. A ship embarking on an exploring expedition was insured for £4,638, et 6½ per cent. per annum: what did the insurance amount to in 6 years?

12. A policy of insurence for £1,500 was obtained on e whale ship, et 7½ per cent. for the voyage: what was the amount paid for insurance?

Case II.

13. If a man pays £16 annually for insuring £800 on his shop, what per cent. does he pay?

Analysis.—If £800, the amount insured, costs £16 premium, £1 will cost $\frac{1}{800}$ of £16; and £16 ÷ £800 = ·02, which is 2 per cent.

Proof.—£800 × ·02 = £16, the premium paid. Hence,

To find tha *rate per cent.*, when tho sum insured and tho annual premium are given.

Divide the given premium by the sum insured, and the quotient will be the rate per cent. required.

Note.—This case is similar in principle to Problem II. in Interest.

14. If a man pays £80 annually for insuring £2,400 on his house and shop, whet per cent. does it cost him?

15. A merchant paye £200 per annum for insuring £8,000 on his goods: what per cent. does he pay?

16. A merchant paid £122 10s. premium on e cargo of flour, worth £12,250, from Charleston to Portland: how much per cent. did he pay?

17. An importer paid £35 insurance on a quantity of cloth, worth £2,800, from London to New York: whet per cent. did he pay?

Case III.

18. A man peys £46 annually for insuring his library, which is 3 per cent. on the amount of his policy: what is the sum insured?

Analysis.—Since £$\frac{3}{100}$ will insure £1 et tho given rate for e year, £45 will insure as many pounds as $\frac{3}{100}$ are contained times in £45; and £45 ÷ ·03 = £1,500. *Ans.*

Proof.—£1500 × ·03 = £45, the given premium. Hence,

To find the *sum insured*, when the premium end the rate per cent. ere given.

Divide the given premium by the rate per cent., expressed in decimals, and the quotient will be the sum insured.

Note.—This case is similar in principle to Problem III. in Interest.

19. An importer paid £650 premium on goods from London to New-York, which was 1½ per cent. on the amount insured: how much did he insure?

20. A merchant paid £1,840 premium on goods from London to Constantinople, which was 2½ per cent. on the worth of the goods insured: how much did he insure?

21. A premium of £487 10s. was paid on e cargo of cotton from Liverpool to New Orleans, which was ¾ per cent. on its valuo: what amount was insured on the cargo?

22. When the rate of insurance is 1½ per cent., what sum can you get insured for £860 premium?

23. At ¾ per cent. per annum, what amount can e men get insured on his house and furniture for £20 10s. per annum?

Case IV.

To find whet sum must be insured on euy given property, so that, if destroyed, its value and the premium may both be recovered.

24. If e man owns e vessel worth £1,920, whet sum must he get insured on it, at 4 per cent., so that, if wrecked, he may recover both the value of the vessel and the premium?

Analysis.—It is plain, when the rate of insurance is 4 per cent. on a policy of £1, the ownor would receive but £$\frac{96}{100}$ towards his loss; for he has paid £$\frac{4}{100}$ for insurence. Since, therefore, tho recovery of £$\frac{96}{100}$ requires £1 to be insured, the recovery of £1,920 will require as many pounds to be insured

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as £$\frac{96}{100}$ is contained times in £1,920; and £1920 ÷ ·96 = £2000. *Ans.*

Proof.—£2000 × ·04 = £80, the premium paid, and £2000 − £80 = £1920, the value of the vessel.

Hence, to find what sum must be insured on a given amount of property, so that, if destroyed, both the value of the property and the premium may be recovered.

Subtract the rate per cent. from £1, then divide the value of the property insured by the remainder, and the quotient will be the sum to be insured.

25. What sum must be insured on property worth £8,240, at 1½ per cent., so that the owner may suffer no loss if the property is destroyed?

26. What sum must be insured on £13,460, at 3 per cent., in order to cover both the premium and property insured?

27. If I send a cargo to the Sandwich Islands worth £25,000, what sum must I get insured, at 7½ per cent., that I may sustain no loss in case of a total wreck?

LESSONS IN GREEK.—No. LVI.

By John R. Beard, D.D.

Attributive Words with Substantive Import; Enlargement of the Predicate.

Attributives employed as Nouns.

An adjective acquires a substantive import when an object, whether a person or a thing, is set forth as the material image of a quality, or when the abstract idea of the quality is designated as a substance in and for itself. Thus, *μελαν*, in the neuter gender, is black; that is, blackness. In the same way we use the concrete black for the abstract blackness. Thus Shakspeare—

"If in black my lady's brows be deckt,"

So *σκληρον*, hard; *καλον*, beautiful; *ταχυ*, swift, are used by the Greeks as nouns. The former member of the statement given above, is illustrated by the fact that some noun of general import is understood with the adjective; as, *ζῳον*, a living (thing); *νεκρον*, a dead (body), a corpse; *χρησιμον*, a useful (thing); *δεον*, what is needful, duty. With each of these adjectives, *χρημα* or *πραγμα* is said to be understood. The simple fact, however, is, that these adjectives in the neuter gender are used as nouns. The adjective in the neuter gender approaches most nearly to the abstract quality, the denoting of which is the office of the substantive. Thus, when we say, "Do you prefer green or yellow?" we use the adjectives as abstractives, meaning the colour green and the colour yellow. Indeed, the noun and the adjective are intimately connected in sense, so that the one may, in many cases, be used for the other in other languages besides the Greek, especially in the Hebrew and the English.

The article is prefixed to these adjectives with substantive meaning, as it is prefixed to appellatives. A participle with the article acquires the form of a noun, and may often be best rendered by a relative clause, *e.g. ὁ μαθων*, the scholar, or he who has learnt; *ὁ βουλομενος*, the willing man, he who is willing; *ὁ χρησομενος*, he who will use; *ὁ τυχων*, he who chances, any one, a common-place person.

This use of the participle with the article gives rise to some of the nicest shades of meaning, and affords great flexibility to the language; these varieties of meaning may be expressed in Greek by means of this form, and by means of the infinitive with the article already noticed, for which other languages have no equivalent except in circumlocutions. For example, the participle of *τυπτω*, with the article, undergoes many modifications.

The Participle with the Article.

Present,	*ὁ τυπτων*,	he who strikes.
Future,	*ὁ τυψων*,	he who will strike.
Aorist,	*ὁ τυψας*,	he who struck.
Perfect,	*ὁ τετυφως*,	he who has struck.

These modifications may be extended through the middle and passive voices.

If an attribute is of such a kind that it belongs either exclusively or preferably to a single object, or if out of the contents of the proposition there undoubtedly or easily arises the idea of the object to which the attribute is ascribed, in such cases the substantive is often omitted in Greek, and the attribute only is employed to denote the object together with its quality. In this way the Greeks use the genitive of possession in union with the article, to designate persons, things, and circumstances which are severally to be regarded as belonging to the idea or person contained in the genitive. Thus the masculine article with the genitive denotes the son of, and in the plural, the relatives of, the subjects of; in general, him, or those persons or things which belong to the object: *e.g. Αλεξανδρος ὁ Φιλιππου*, Alexander the (son) of Philip; *οἱ ἐμαυτοῦ*, the of me, that is, my (friends, children, etc.), mine; *οἱ Περικλεους*, the (family) of Pericles. The feminine article with the genitive, after a similar manner, signifies the wife or the daughter of: *e.g. Μαῖα ἡ Ατλαντος*, Maia the (daughter) of Atlas; *ἡ Σωκρατους Ξανθιππη*, Xantippe, the (wife) of Socrates. The neuter article with the genitive indicates in the most general manner that which belongs to a person—his possessions, his condition, his circumstances: *e.g. τα του Θεμιστοκλεους*, the (relations, condition) of Themistocles; *τα του κυνος*, the (nature) of the dog; *τα φιλων*, the (interests) of friends; *τα της πολεως*, the (affairs) of the city. Sometimes this form of expression is employed merely to designate the object itself contained in the genitive, as, *τα της τυχης*, fate, fate particularly considered in its workings; *τα της αρετης*, virtue in its most comprehensive form. As intimated in the last lesson, adverbial attributes in connexion with the article, are often employed to denote the relations of time, place, and things indicated in the adverbs severally; thus, *οἱ ἐξω*, those (who are) without; *οἱ προτερον*, those (who were) aforetime. In a similar manner with prepositions may the article be used: *e.g. ὁ ἐπι τινι*, the (person who is) over something, the superintendant; *οἱ ὑπο τινι*, those (who are) under some one, his subjects; *το ἐμ' ἐμοι*, so far as I am concerned; *τα προς τινα*, the relations to some one; *οἱ απο τινος*, his descendants; *οἱ ἐν τῃ πολει*, the indwellers of the city; *οἱ ἐν τῃ ἡλικιᾳ*, those who are of age; *οἱ κατα τινα*, and *οἱ ἐπι τινος*, the contemporaries. *Οἱ ἀμθι τινα*, and *οἱ περι τινα*, originally meant some great person and his attendants; but as the eye was always directed chiefly to the great person himself, so in time it fixed exclusively on him, and the phrase came to denote the principal personage alone.

With adjectival attributes, nouns were omitted which suggest themselves from the nature of the attribute itself. Thus, *χειρ* is omitted with *ἡ δεξια*, the right (hand), *ἡ ἀριστερα*, the left (hand); *μερις* with *ἡ δεκατη*, the tenth (part), *ἡ εἰκοστη*, the twentieth (part), etc.; *μοῖρα*, a portion, an allotment, with *ἡ εἱμαρμενη*, *ἡ πεπρωμενη*, fate, fortune; *γῆ* or *χωρα* with *ἡ φιλια*, and *ἡ πολεμια*, a friendly (country), a hostile (country); and so with the adjectives denoting names of countries, as, *ἡ Αττικη* (scil. *γῆ*); also, *ἡ πολλη* (*γῆ*), the greatest part, the most part; *ὁδος* with *ἡ εὐθεῖα*, the straight, direct (way); and *ἡμερα*, with the cardinal numbers, to indicate the days of the month, as, *ἡ ὑστεραια*, *ἡ ἐπιοῦσα*, *ἡ αυριον*, the next day, the coming day, the morrow; and *ἡ προτεραια*, the day before. *Τεχνη* is understood with adjectives ending in *ικη*, denoting skill in a certain art or profession, *e.g. ἰατρικη*, the healing (art), *ῥητορικη*, the speaking (art), whence the word (and the form of the word) *rhetoric*. *Ἱερα*, rites, is to be supplied with the names of festivals, as, *τα ἐπινικια*, the victor's (festival); *τα Διονυσια*, the (feast) of Bacchus, the Bacchanalia. So *γνωμη* goes with *ἡ νικῶσα*, the conquering (opinion), the prevailing view. In the same way are used several technical terms, as, in the military art, *το δεξιον* (scil. *κερας*, wing), the right; *τα εὐωνυμον*, the left (wing); also the grammatical word *πτῶσις*, case, *e.g. γενικη*, genitive, *δοτικη*, dative, etc. In the same way *συλλαβη*, syllable, is understood with *λῆγουσα*, the terminating syllable; *παραλῆγουσα*, the penult, that is the last syllable but one; and *προσῳδια*, accent with *βαρεῖα*, *ὀξεῖα*, the acute and the grave; *βιβλος* and *βιβλιον*, also *συγγραμμα*, book, writing, with parts and titles of books; finally, the musical term *χορδη*, string, is implied with *ὑπατη*, the highest, *νητη*, the lowest (on the lyre), and *ἁρμονια*, concord, with *ἡ δια πασῶν*, *ἡ δια τετταρων*, etc.

Other omissions of substantives are permitted only when

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they may be readily learnt from the verbs, which, if expressed, they would accompany. Thus, with verbs signifying to go, etc., ὁδός is omitted, *e.g.* πορευεσθαι μακραν (ὁδον), to go a long way (far); so with λειαν, an easy road; τραχειαν, a rough road; ιεναι την παρα τειχος, to go along the road by the wall; τρεπεσθαι την επι Μεγαρα, to enter on the road to Megara; ἡγεισθαι την συντομωτατην, to lead on the shortest road; αγειν την επι θανατῳ, to conduct to death. On the same principle are explained ellipses (omissions) like την εναντιαν (ψῆφον) θεισθαι, to vote in opposition; ερημην (δικην) κατηγορειν, to bring a deserted charge, that is, to accuse a person in his absence; ισην (δικην) τινειν, to undergo equal justice, to pay the penalty, to atone for; κοιμᾶσθαι βαθυν (ὑπνον), to sleep a deep sleep; and the like.

With the prepositions εν and εις, you often find the genitive of a personal noun to signify the residence of the person, which is left out, as being easily supplied by the mind. Thus the Greeks commonly said, φοιτᾶν εις διδασκαλου, to go to school; εις φιλαν, to a friend's; that is, to the house of a teacher, the house of a friend; εις εμαυτᾶ, to my house; εις το των σεμνων θεων, to the temple of the Furies; εν Ασκληπιου, in the temple of Æsculapius; so, εν καθαριστοῦ μαθειν, to learn in a harper's house, in an academy of music. Very common, and for the most part without variation, are the phrases εν Αἰδαν, in Hades (hell), εις Αἰδοα, to Hades (scil. δομον and δομφ).

Enlargement of the Predicate.

The enlargement of the predicate is partly external, partly internal. The external enlargement of the predicate consists in this, that several predicated qualities are ascribed to a common subject. Several predicate terms which have a common subject are united to each other by copulative participles, και, τε — και, τε — τε, και — και; or by the disjunctive particles, η, η — η; or, again, by the adversative (opposing) particles, μεν — δε, αλλα.

The internal enlargement of the predicate is two-fold; it is either attributive or objective. If attributive, it more closely defines the nature and the circumstances of what is declared in the predicate. If it is objective (or transitive), it indicates the object to which what is said in the predicate is directed.

Enlargement of the Predicate by an Attribute.

The attribute added to the predicate contains either an essential idea which individualises and determines (*determinative* attribute) the idea conveyed in the predicate, and then connects itself in an adverbial form with the predicate, or a merely accidental idea which joins (*appositive* attribute) or arises out of (*explanatory* attribute) the predicate, and appears either in an adverbial form or in the form of a noun agreeing with the subject.

The adverb, as being indeclinable, requires no special grammatical rules for its application. However, one kind of adverbs, namely, the negative—that is, those which separate a predicate from the subject—have in their application as well as their position, much that is peculiar.

In simple and direct propositions the negative adverb is ου, which becomes ουκ before a vowel, and ουχ before an aspirated vowel. Negative propositions which deny the predicate of a whole species of subjects, become negative by a negative adjective added to the subject; and if the predicate goes before the subject, the negative adverb as may also be employed: thus, ουδεις αντιλεγει, but ουκ αντιλεγει ουδεις, no one contradicts.

Our usage, in which we connect the negative with the noun of the predicate, is not customary in Greek, except when the object is of general acceptation; thus,

οἱ των Αθηναιων νομοι ουδεν ωμον προστττουσιν
the laws of the Athenians enjoin nothing cruel;

which may appear also in this form—

οἱ των Αθηναιων νομοι ου προστττουσιν ωμον ουδεν.

If, however, you speak of individual objects, the negative goes with the verb, and the object is without a negative, *e.g.*

ουκ ιχω ἱππον	ουκ εστι μοι οικια
I have not a horse	I have not a house,

for I have no horse, I have no house.

Terms of general import which are added to the predicate of the negative proposition in a substantive or adverbial form, and which are added to the object in the form of adjectives, are generally each accompanied by a negative. Instances are given in the exercise, besides the following:

ουκ εστιν ουτε τειχος ουτε χρηματα ουτ' αλλο δυσφυλακτον ουδεν ὡς ἡ γυνη
nothing is so difficult to guard as a woman—neither a fort, nor property, nor anything else

Θιος ουδαμῆ ουδαμως αδικος
God is in no way at all unjust.

In regard to the position of the negative, the following remarks have to be observed.

Since the negative destroys the connection between the subject and the predicate, it belongs to that word in the sentence which denotes that connection, that is, to the verb, before which it ordinarily stands; but if a special reference to any other word is intended, then it comes before that word, having thus the effect of our emphatic accent:

1. ταυτ' ουκ εστι καλα (or)
2. ου ταυτ' εστι καλα (or again)
3. ταυτ' εστιν ου καλα
these things are not honourable;

where the first sentence denies in a general way, separating the predicate from the subject; the second sentence throws the emphasis on ταυτα, the subject, and the third on καλα, the attribute. In English, the form of the first proposition is given by the translation as it stands above; if you wish to give the force of the second sentence, you must emphasise *these things*; and for the effect in the third sentence, you must throw the accent on *honourable*. Thus, *these* things (whatever may be said of other things) are not honourable; and, these things are not *honourable* (whatever else they may be).

If the sentence is positive in itself, but contains a negative accessory which is set in opposition to the positive idea, then the negative is subjoined to the accessory, *e.g.*

ὑπερφρονοῦσι μεν ἡμας, ὑπομενουσι δ' ου
they despise us, indeed, but do not endure us.

When, however, the negation is merely in the form which occurs when the opposed positive is merely in the thought, then the negation precedes the accessory:

ξυμμαχοι εγενομεθα τοις Αθηναιοις ουκ επι καταδουλωσει των Ἑλληνων
we became allies to the Athenians not for the enslavement of the Greeks.

Exercises.—Greek-English.

Θιος ουδαμῆ παδαμως αδικος, και ουκ εστιν αυτῳ ὁμοιοτερον ουδεν η ὁτι αν ἡμων γενηται δικαιοτατος. Το μονοιδες ανδρωτι ουδαμῆ παδαμως αλλοιωσιν οιδιμιαν ενδεχεται. Ην ὁ ποταμος ὕδατος δειδρομι παχυπι μεν αν, πυκνους δε. Συμμαχοι εγενομεθα τοις Αθηναιοις ουκ επι καταδουλωσει των Ἑλληνων, αλλ' επ' ελευθερωσει. Σωκρατης επιμελεισθαι θιους ενομιζεν ανθρωπων, ουχ ὁν τροπον οἱ αλλοι νομιζουσιν. Οἱ Ἑλληνις τα παλαι ετραποντο προς λογισιαν, ἡγουμενων ανδρῶν νυ των αδυνατωτατων. Ἡ πολις ουχ ικανη εστιν. Καλος μεν εστι, μεγας δ' αν. Ου δη που και συ εἰ των τοιουτων ανθρωπων. Παντες μεν ουκ ηλθον, Αριαιος δε. Τουτο γε ουκ οιομαι. Ουτε πρῶτος, ουτε δευτερος, οιομαι δε ουδε χιλιοστος. ισως δε ουδε μυριοστος εστι. Ἡ αστρονομια ουαγκαζει την ψυχην εις το ανω ὁρᾶν, κ απα των ενθενδε εκεισε αγει. Εν τῃ γῃ αρχουσι Λακεδαιμονιοι και εν τῃ θαλαττῃ των νυν χρονον. Τα πλειστα των περι τον βιον ου δι' αυτα τα πραγματα ποιουμεν, αλλα των αποβαινοντων ἑνεκεν διαπονουμεν. Γυμνασαι πρῶτον, ω μακαριε, και μαθε ἁ δει μαθοντα ἑναι επι τα της πολιως. Ὁ Κυρος τους ὑφ' ἑαυτῳ ὡσπερ ἑαυτοῦ παιδας ἐθιρεπτευεν. Εικοτως τα των Ἑλληνων ην τῳ βαρβαρῳ φοβερα, ουχ ὁ βαρβαρος τοις Ἑλλησι. Ἱππικον ουκ εἶχεν ὁ Αγησιλαος στρατευομενος επι Καριαν. Διαιτα μεν λεγοντες πολλοι αδικα

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ποιοῦσι, δικαια δε πραττων ανδρις αδικος αν ειη. Ουδεις προς ταδ' αντιπους βροτων.

Vocabulary and Remarks.

Ος αν ἡμων, etc., *than the most just of men.*

Μονοειδης, ες (μονος and εἰδος, *appearance*), *that which has one shape or form, the simple, simplicity.*

Αλλοιωσις, εως, ἡ, *change, difference.*

Δασυς, εια, υ, *thick, thicket,* as a copse or thicket, *overgrown.*

Παχυς, εια, υ, *thick, large.*

Πυκνος, η, ον, *close together;* these three words δασυς, παχυς, and πυκνος, may all be rendered by our *thick*; δασυς, is thick in the sense of being overgrown; παχυς, is thick, as individuals are thick, that is, large in circumference; and πυκνος, means thick, as when objects are close together.

Διαζωμα (δια and ζωννυμι), *a girdle, a wrapper.*

Historical Anecdotes.

Κολασαντος δε τινος ἰαχυρως ακολουθον, ηρετο Σωκρατης τι χαλεπαινοι τῳ θεραποντι. Ὁτι, εφη, οψοφαγιστατος τε ων βλακιστατος εστι και φιλαργυρωτατος ων αργοτατος. Ηδη ποτε ουν επεσκεψω πατερος πλειονων πλεθρων δεῖται, συ η ὁ θεραπων; Φοβουμενου δε τινος την εις Ολυμπιαν ὁδον, Τι, εφη, φοβῃ αν την πορειαν; ου και οικοι σχεδον ἀλλην την ἡμεραν περιπατεις; και εκεῖσε πορευομενος περιπατησας αριστησεις, περιπατησας δειπνησεις και αναπαυσῃ· οικ οἶσθα, ὁτι, αν εκτεινας τους περιπατους, οὐς εν πεντε η ἑξ ἡμεραις περιπατεῖς, ῥᾳδιως αν Αθηνηθεν εις Ολυμπιαν αφικοιο; χαριεστερον δε και προεξορμᾶν ἡμερᾳ μᾷ μαλλον η ὑστερίζειν· Το μεν γαρ αναγκαζεσθαι περαιτερω του μετριου μηκυνειν τας ὁδους χαλεπον, το δε μιᾷ ἡμερᾳ πλειονας περινθῆναι πολλην ῥαστωνην παρεχει· κρεῖττον ουν εν τῃ ὁρμῃ απειδειν η εν τῃ ὁδῳ. Αλλου δε λεγοντος ὡς παρεταθη μακραν ὁδον πορευθεις, ηρετο αυτον τι και φορτιον ἠφερε. Μα Δι', ουκ εγωγ', εφη, αλλα το ἱματιον. Μονος δ' επορευον, εφη, η και ακολουθος σοι ηκολουθει; Ηκολουθει, εφη. Ποτερον κενος, εφη, ἡ φερων τι; Φερων νη Δι', εφη, τα τε στρωματα και τἀλλα σκευη. Και πῶς δῃ, εφη, απηλλαχεν εκ της ὁδου; Εμοι μεν δοκεῖ, εφη, βελτιον εμοῦ. Τι ουν, εφη, ει τα εκεινου φορτιον ἐδει σε φερειν, πῶς αν σοι διατεθῆναι; Κακῶς νη Δι', εφη· μᾶλλον δε ουδ' αν ηδυνηθην κομισαι. Το οὖν τοσουτῳ ἧττον τοῦ παιδος δυνασθαι πονειν πῶς ηκημενον δοκει σοι ανδρος εἶναι.

Vocabulary, etc.

Κολαζω, *I punish.*

Οψοφαγος (ὀψον, *a delicacy,* and φαγω, *I eat*), *fond of good living.*

Αργος (α, *not,* and εργον), *idle.*

Αρισταω, ησω, *I breakfast* (αριστον).

Δειπνεω, ησω, *I dine, I take the chief meal of the day.*

Αναπαυω, *I cause to rest;* mid. *I rest.*

Προεξορμαω, *I advance.*

Ὑστερίζω, *I come too late, I remain behind.*

Παρατεινω, *I extend;* pass. *I am worn out.*

Στρωμα, ατος, το, *coverings, carpets,* etc., *for use in travelling.*

Απαλλασσω, *I set free;* mid. or pass. *I come off, I leave in a certain condition;* quomodo discesserit ex itinere? *how was he after his journey?*

Διατιθημι, *I place, I affect;* πῶς αν σοι διατεθῆναι, *in what condition would you have been? μᾶλλον δε, or rather I could not have carried it.*

Το οὖν τοσουτῳ, etc., *how do you think that being so inferior to your slave in the power of enduring labour, becomes a well-educated man? ηκημενον, practised, exercised,* that is, in the gymnasium, or place for bodily exercise, access to which was forbidden to slaves.

What parts of the verbs are επεσκεψω; φοβουμενου; εφη; φοβῃ; πεπατησας; οἶσθα; εκτεινας; αφικοιο; πορευθηναι; παρεταθη; ἠφερε; ηκολουθει; απηλλαχεν; διατεθηναι; ηδυνηθην; κομισαι; ηκημενον? What is meant by the periphrastic future? How does the third future differ from the first? What is the exact meaning of the aorist? How do you distinguish the form of the aorist from the form of the imperfect? how are the two distingnished in meaning? What is the essential characteristic of the indicative mood? of the subjunctive? of the optative? of the infinitive? What force has the particle αν? with the indicative? with the subjunctive? with the optative? What is meant by the enlargement of the subject and the predicate? In what two ways may they each be enlarged? Give instances in English, and in Greek. What are attributives? What are determinatives? What is apposition? Write out a list of the chief peculiarities in the use of the article.

LESSONS IN SPANISH.—No. X.

Conjugation.—*Continued.*

Estár, to be.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *estár*, to be.	Past: *haber estádo*, to have been.
Present Gerund: *estándo*, being.	Past Gerund: *habiéndo estádo*, having been.
Past Participle: *estádo*, been.	

Indicative Mood.

Present.	Perfect Indefinite.
Estóy, I am.	*He estádo*, I have been.
Estás, thou art.	*Has estádo*, thou hast been.
Está, he is.	*Ha estádo*, he has been.
Estámos, we are.	*Hémos estádo*, we have been.
Estáis, you are.	*Habéis estádo*, you have been.
Están, they are.	*Han estádo*, they have been.
Imperfect.	**First Pluperfect.**
Estába, I was.	*Habia estádo*, I had been.
Estábas, thou wast.	*Habias estádo*, thou hadst been.
Estába, he was.	*Habia estádo*, he had been.
Estábamos, we were.	*Habiámos estádo*, we had been.
Estábais, you were.	*Habiáis estádo*, you had been.
Estában, they were.	*Habian estádo*, they had been.
Perfect Definite.*	**Second Pluperfect.**
Estúve, I was.	*Húbe estádo*, I had been.
Estuvíste, thou wast.	*Hubísto estádo*, thou hadst been
Estúvo, he was.	*Hubo estádo*, he had been.
Estuvímos, we were.	*Hubímos estádo*, we had been.
Estuvísteis, you were.	*Hubísteis estádo*, you had been.
Estuviéron, they were.	*Hubiéron estádo*, they had been.
First Future.	**Second Future.**
Estaré, I shall or will be.	*Habré estádo*, I shall or will have been.
Estarás, thou shalt or wilt be.	*Habrás estádo*, thou wilt have been.
Estará, he shall or will be.	*Habrá estádo*, he will have been.
Estarémos, we shall or will be.	*Habrémos estádo*, we shall have been.
Estaréis, you shall or will be.	*Habréis estádo*, you will have been.
Estarán, they shall or will be.	*Habrán estádo*, they will have been.

Imperative Mood.

[No First Person.]

Está, be thou.
Esté, let him be, or may he be.
Estémos, let us be, or may we be.
Estád, be you.
Estén, let them be, or may they be.

* The persons of the perfect definite and those of the imperfect of the indicative mood, in Spanish, are both rendered by the English past tense; but they cannot be used indiscriminately in Spanish.

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Subjunctive Mood.

Present.	Perfect Indefinite.
Esté, I may be.	*Háya estádo*, I may have been.
Estés, thou mayest be.	*Háyas estádo*, thou mayst have been.
Esté, he may be.	*Háya estádo*, he may have been.
Estémos, we may be.	*Háyamos estádo*, we may have been.
Estéis, you may be.	*Háyais estádo*, you may have been.
Estén, they may be.	*Háyan estádo*, they may have been.
Imperfect.	**Pluperfect.**
Estuviéra, estaría, estuviése, I would, should, might be.	*Hubiéra, habría, hubiése estádo*, I would, should, might have been.
Estuviéras, estarías, estuviéses, thou wouldst, shouldst, mightst be.	*Hubiéras, habrías, hubiéses estádo*, thou wouldst, shouldst, mightst have been.
Estuviéra, estaría, estuviése, he would, should, might be.	*Hubiéra, habría, hubiése estádo*, he would, should, might have been.
Estuviéramos, estaríamos, estuviésemos, we would, should, might be.	*Hubiéramos, habríamos, hubiésemos estádo*, we would, should, might have been.
Estuviérais, estaríais, estuviéseis, you would, should, might, be.	*Hubiérais, habríais, hubiéseis estádo*, you would, should, might have been.
Estuviéran, estarían, estuviésen, they would, should, might be.	*Hubiéran, habrían, hubiésen estádo*, they would, should, might have been.
First Future.	**Second Future.**
Si estuviére, if I should be.	*Si hubiére estádo*, if I should have been.
Si estuviéres, if thou shouldst be.	*Si hubiéres estádo*, if thou shouldst have been.
Si estuviére, if he should be.	*Si hubiére estádo*, if he should have been.
Si estuviéremos, if we should be.	*Si hubiéremos estádo*, if we should have been.
Si estuviéreis, if you should be.	*Si hubiéreis estádo*, if you should have been.
Si estuviéren, if they should be.	*Si hubiéren estádo*, if they should have been.

The different persons of the verb *estar* are generally rendered in English the same as those of the verb *ser*; but in Spanish these verbs are not employed indiscriminately, the one for the other. *Ser* is used to affirm what a person or thing is *naturally* (or *by nature*), as well as *habitual* qualities, or *permanent* or *characteristic* properties of an object. *Estar* is used to affirm *how* any thing exists at *any period of time*, or *where* any thing exists. Thus the sentences, *la doncella* es *amable*, and *la doncella* está *amable*, would each be rendered in English by "the maid *is* amiable;" but in Spanish the former means "the maid is amiable" naturally or permanently, *i. e.* of an amiable disposition; the latter means "the maid is amiable" for the time being, though her disposition may be far from being amiable. "Mary is beautiful," is rendered *María es hermosa*, since it is intended to affirm a natural quality of Mary, or *what* she is; and "Mary is sad," is rendered *María está triste*, since it is intended to affirm a merely accidental or transient quality, or *how* she is. "Mary is in the country," is rendered *María está en el campo*, since *estar* (and not *ser*) is used to affirm *where* a thing is. *Juan es bueno*, means "John is good," affirming what John is; *Juan está bueno*, means "John is well," *i. e.* in good health, affirming how John is.

Vocabulary.

Fonda, hotel.
Inglaterra, England.
Campo, country, field.
Triste, sad, sorrowful.
Enfadado, angry.
Ocupado, busy, occupied.
Caliente, warm.
Bueno, well.
Aquí, here.
¿ Cómo ? how ?
Siempre, always.
¿ Cuanto ? how much ?
Mesa, table.
El señor T—, Mr. T—.
La señora T—, Mrs. T—.
La señorita T—, Miss T—.
Contento, contented, pleased.
Enfermo, sick, ill.
Cansado, weary, tired,
Presente, present.
Sobre, upon.
Allí, there.
¿ Dónde ? where?
Luego, soon, immediately.
En casa, at home.
Con, with.
Plomo, lead.
Media, stocking.
Candelero, candlestick.
Ciego, blind.
Pesado, heavy.
Miel (fem.), honey.
Seda, silk.
Agrio, sour.
Enfermizo, sickly.
Escribiendo, writing.

Model Sentences.

¿ Cómo está usted ? Estoy muy bueno. How are you ? I am very well.
Los pintores están en el campo, the painters are in the country.
La señorita T— siempre está ocupada, Miss T— is always busy.
Mi padre es ciego, my father is blind.
¿ Dónde está mi libro ? Aquí está, where is my book? Here it is.
Mi hermana está ciega de ira, my sister is blind with passion.
Juan es enfermizo, John is sickly.
Pedro está escribiendo, Peter is writing.

Spanish-English.

El Frances está en la ciudad. Estoy en la calle. Estamos tristes. Están contentos. Estáis enfadados. Estás enfermo. Está ocupado. Estoy cansado. El água está caliente. Estás en tu casa. Los abogados están en la fonda. Mi padre está en la ciudad. ¿ Estáis cansados? No estamos cansados. El impresor siempre está ocupado. Siempre estás ocupado. ¿ Dónde está la fonda? Aquí está. ¿ Dónde está el libro de Juan? Aquí está. ¿ Dónde están mis cucharas, cuchillos, y tenedores? Aquí están. ¿ Dónde está mi sombrero? Está sobre la mesa. ¿ Cómo está V.? Estoy bueno. ¿ Cómo está la señora B—? Está buena. ¿ Cómo está la señorita B—? No está muy buena. ¿ Está el señor B— en casa? Está en casa. ¿ Están vms. buenos? Estamos buenos. ¿ Está vmd. cansado? ¿ Está Pedro en Madrid? No, señor, está en Inglaterra. Diego está en el campo. El libro está sobre la mesa.

Estaba enfermo. Yo estabe contento. Estábamos presentes. Estaban cansados. La señora B— estaba ocupade. Vms. estaban presentes. Estabas enfermo. Estábais presentes. ¿ No estaba V. en el campo? ¿ No estaba mi padre en la calle? ¿ Estábamos en la ciudad? Estabas con tu amigo.

Estuve triste dos años. ¿ Estuvisteis allí muchos años? ¿ Estuviste allí? ¿ Estuvo allí? ¿ Estuvieron tristes? ¿ Estuvo vmd. mucho* tiempo con el juez? Nunca he estado en Inglaterra. ¿ Cuanto tiempo† has estado en Inglaterra? Nunca hemos estado en Inglaterra. He estado muy enfermo. Habíamos estado muy enfermos.

Juan estará en su casa. Estaré ocupado. Estarán con vmd. luego. Estarás presente. Estaremos en nuestras casas. Estaréis presentes. Estaré con vms. luego. Pedro estará con nosotros luego. Estaré en Lóndres luego.

Estad contentos. Estemos contentos. Estén presentes. Está contento. Esté el água caliente. Es posible que Pedro esté en su casa. Es posible que estéis presentes. Probable es que los abogados estén cansados. Si Juan estuviese presente, María estuviera contento. No creo que la señora B— haya estado jamás (*ever*) contento. ¡ Ojalá no hubiese yo estado enfermo! ¡ Ojalá V. hubiese estado presente! Estando enfermo el juez dió su dinero á sus hijos.

English-Spanish.

The Spaniard is in the city. I am in the street. We are sad. They are contented. Ye are angry. Thou art ill. He is busy. I am tired. The water is hot. Thou art in thy

* *Mucho tiempo*, much time, equivalent to long time, or, a great while, in English.
† *Cuanto tiempo*, how much time, meaning, how long.

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house. The lawyers are in the hotel. My father is in the city. Are-you tired? We-are not tired. The printer is elways occupied. Thou-ert[2] elways[1] busy. Where is the hotel? Here it-is. Where is John's book? Here it-is. Where ere my spoons, knives, and forks? Here they-are. Where is my hat? It-is upon the table. How are you? (how is yonr-worship?) I-am well. How is Mrs. B—? She-is well. How is Miss B—? She-is not very well. Is Mr. B— et home? He-is et home. Are you (*vms.*) well? We-are well. Are you (*vmd.*) tired? I-em not tired. Is Peter in Madrid? No, sir, he is in England. James is in the country. The book is upon the table. The buttons are in the hat. The printer is in the hotel. The painter is busy. My brothers ere in the country. How are my friends? They are not very well.

[The verb in the following paragreph is to be rendered by the imperfect tense in Spanish.]

He was ill. I was contented. We-were present. They-were tired. Mrs. B— was busy. You (*vms.*) were present. Thou-wast ill. Ye-were present. Were you (*V.*) not in the country? Was not my father in the city? Were-we not in the street? Thou-wast with thy friend.

I-was (perf. def.) sad two years. Were-ye there many years? Wast-thou there? Was-he there? Were-they sad? Were you (*vmd.*) [a] long (*mucho*) time with the judge? I-have never been in England. How long hast-thou been in England? We-have never been in England. I-heve been ill. We-had been very sick.

John will-be in his house. I-shall-be busy. They-will-be with you (*vmd.*) soon. Thou-wilt-he present. We-shall-be in our houses. Ye-will-he present. I-shall-be with you (*vms.*) soon. Peter will-be with us immediately. I-shall-be in London soon.

Be-ye contented. Let-us-be contented. May-they-be present. May-he-be contented. Let the weter be warm. It-is possible that Peter may-be in his house. It-is possible that ye-mey-be present. It-is probable that the lawyers may-be tired. If John should-be present, Mary would-be pleased. I do not believe that Mrs. B— can-have ever (*jamás*) been contented. O-that I had not been sick! O-that you (*V.*) had (say might-have) been present! The[3] judge[4] being[1] ill[2], gave his money to his sons.

[The student can proceed to write and re-write all the parts of this verb (*estar*), continuing the practice till he has committed it to memory, and afterwards translate the following exercises on *ser* and *estar*.]

Thou ert proud. Thou ert angry. Death is terrible. We ere in the street. My father is very rich. My mother is very sorrowful. Lead is heavy. The milk is sour. Honey is sweet. The honey is warm. I am e German. I am angry. We are imprudent. We ere ill. She-is old. She-is contented. My mother is blind. My daughter is blind with (*de*) anger (*ira*). Mary is beautiful. Lucy is busy. John is good. John is well. The spoon is of gold. The spoon is upon the table. The fork is mine. The fork is in the house. The stockings are of silk. The stockings are in the street. The book is for Mary. The book is in the hotel. The stockings ere for Lucy. Here are the stockings. I-am young. I-am writing. My mother is sickly. My mother is sick. The candlesticks are gold. The buttons ere silver. The looking-glass is new. The candlestick is silver. They-are writing. Sugar is sweet. This het is for John. They-are wise. They-are sorrowful. Where is my hat? Here it-is. My shoes are silk.

LESSONS IN READING AND ELOCUTION.
No. XXV.

CHARACTER OF JULIUS CÆSAR.

[Extract from e Debate for Young Speakers.]

First Speaker.—"Was Cæsar e great man?"—Whet revolution has taken place in the first appointed government of the universe—what new and opposite principle has begun to direct the operetions of neture—whet refutation of their long established precepts has deprived reason of her sceptre, and virtue of her throne, that e charseter which forms the nohlest theme thet ever merit gave to fame, should now become a question for debete?

No painter of human excellence, if he would drew the features of thet hero's charseter, needs study a favourable light or striking attitude. In every posture it has majesty; and the lineaments of its beauty are prominent in every point of view.

It is e generally received opinion, thet uncommon circumstances make uncommon men,—Cæsar was an uncommon man in common circumstances. The colossal mind commands your admiration, no less in the pirete's captive, than in the victor at Pharsalia. Who, bnt the first of his race, could have made vassals of his sevage masters, mocked them into reverence of e superior neture, and threatened, with security, the power that held him at its mercy? Of all the striking incidents of Cæsar's life, had history preserved for us hut this single one, it would have been sufficient to make us fancy all the rest—et least we should have said, "Such e man was born to conquest, and to empire!"

To expetiate on Cæsar's powers of oratory, would only be to add one poor eulogium to the testimony of the first historians. Cicero himself grants him the palm of almost pre-eminent merit; and seems at a loss for words to express his admiration of him. His voice was musical, his delivery energetic, his languege chaste and rich, eppropriate and peculiar. And it is well presumed, thet, had he studied the art of public speaking with as much industry as he studied the art of war, he would have been the first of orators. Quintilian says, he would have been the only man capable of combating Cicero; hut granting them to have been equal in ebility, what equal contest could the timid Cicero—whose nerves fail him, and whose tongue falters when the forum glitters with arms—what equal contest could he have held with the man whose vigour chastised the Belgæ, and annihilated the Nervii, that maintained their ground till they were hewn to pieces on the spot?

His ebilities as e master of composition were undoubtedly of the first order. How admirable is the structure of his commentaries! What perspicuity and animation are there in the details! You fancy yourself upon the field of action! You follow the development of his plans with the liveliest curiosity! You look on with unwearied ettention, as he fortifies his camp or invests his enemy, or crosses the impetuous torrent!—You behold his legions, as they move forward from different points to the line of hattle—you heer the shout of the onset, and the crash of the encounter; end hreathless with suspense, mark every finctuetion of the ewful tide of war!

As e politician, how consummete was his address!—How grand his projections!—How happy the execution of his meaeures. He governs his province with such equity and wisdom, as add a milder hut a fairer lustre to his glory, and by their fame prepare the Roman people for his happy yoke. Upon the very eve of his rupture with Pompey, he sends back, on demand, the borrowed legions, covering with rewards the soldiers that may no longer serve him, and whose weapons on the morrow mey be turned against his breast—presenting here e noble example of his respect of right, and of that magnanimity which maintains that gratitude should not cease, though benefits are discontinued. When he reigns sole master of the Roman world, how temperate is his triumph!—how scupulous his respect for the very forms of the laws! He discountenances the profligacy of the patricians, and endeavours to preserve the virtue of the state, hy laying wholesome restraints upon luxury. He encourages the arts and sciences, petronizes genius and talent, respects religion and justice, and puts in practice every means that een contribute to the welfare, the heppiness, and the stability of the empire.

It is unnecesary to recount the military exploits of Cæser. Why should I compel your attention to follow him, for the hundredth time, through hostile myriads, yielding et every encounter to the force of his invincible arms? As a capteun, he was the first of warriors; nor were his valour and skill more admirable than his abstinence and wetchfulness, his disregerd of ease and his endurance of labour, his moderation and his mercy. Perhaps, indeed, this last quality forms the most dominent feature in his character; and proves, hy the consequences of its excess, that virtue itself requires restraint, and'

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has its proper bounds, which it ought not to exceed—for Cæsar's moderation was his ruin!

That Cæsar had a heart susceptible of friendship, and alive to the finest touches of humanity, is unquestionable. Why does he attempt so often to avert the storm of civil war?—Why does he pause so long upon the brink of the Rubicon?—Why does he weep when he beholds the head of his unfortunate rival? Why does he delight in pardoning his enemies—even those very men that had deserted him?

It seems as if he lived the lover of mankind, and fell—as the bard expresses it—vanquished, not so much by the weapons as by the ingratitude of his murderers.

If a combination of the most splendid talents for war with the most sacred love of peace—of the most illustrious public virtue with the most endearing private worth—of the most unyielding courage with the most accessible moderation, may constitute a great man, that title must be Cæsar's!

Second Speaker.—No change has taken place in the first appointed government of the universe—the operations of nature acknowledge now the same principle that they did in the beginning—reason still holds her sceptre, virtue still fills her throne; and the epithet of great does not belong to Cæsar!

I would lay it down, as an unquestionable position, that the worth of talents is to be estimated only by the use we make of them. If we employ them in the cause of virtue, their value is great; if we employ them in the cause of vice, they are less than worthless—they are pernicious and vile. Now let us examine Cæsar's talents by this principle, and we shall find, that neither as an orator nor as a politician—neither as a warrior, nor as a friend—was Cæsar a great man!

If I were asked, "What was the first, the second, and the last principle of the virtuous mind?" I should reply, "It was the love of country." It was the love of parent, brother, friend!—the love of man!—the love of honour, virtue and religion!—the love of every good and virtuous deed?—I say, then, if I were asked, "What was the first, the second and the last principle of the virtuous mind?" I should reply, "It was the love of country!" Without it man is the basest of his kind!—a selfish, cunning, narrow speculator!—a trader in the dearest interests of his species!—reckless of every tie of nature—sentiment—affection! What was Cæsar's oratory?—How far did it prove him to be actuated by the love of country? It justified for political interest the invader of his honour;—sheltered the incendiary!—abetted treason!—flattered the people into their own undoing!—assailed the liberties of his country, and bawled into silence every virtuous patriot that struggled to uphold them! He would have been a greater orator than Cicero! I question the assertion—I deny that it is correct!—He would have been a greater orator than Cicero! Well!—let it pass—he might have been a greater orator, but he never could have been so great a man. Which way soever he directed his talents, the same inordinate ambition would have led to the same results; and, had he devoted himself to the study of oratory, his tongue had produced the same effects as his sword, and equally desolated the human kingdom.

But Cæsar is to be admired as a politician! I do not pretend to define the speaker's idea of a politician; but I shall attempt to put you in possession of mine. By a politician, I understand a man who studies the laws of prudence and of justice as they are applicable to the wise and happy government of a people, and the reciprocal obligations of states. Now, how far was Cæsar to be admired as a politician? He makes war upon the innocent Spaniards, that his military talents may not suffer from inaction. This was a ready way to preserve the peace of his province, and to secure its loyalty and affection! That he may be recorded as the first Roman that had ever crossed the Rhine in a hostile manner, he invades the unoffending Germans, lays waste their territories with fire, and plunders and sacks their country. Here was a noble policy!—that planted in the minds of a brave and formidable people the fatal seeds of that revenge and hatred, which finally assisted in accomplishing the destruction of the Roman empire! In short, Cæsar's views were not of that enlarged nature which could entitle him to the name of a great politician; for he studied not the happiness and interest of a community, but merely his own advancement, which he accomplished—by violating the laws and destroying the liberties of his country.

That Cæsar was a great conqueror, I do not care to dispute. His admirers are welcome to all the advantages that result from such a position. I will not subtract one victim from the hosts that perished for his fame; or abate, by a single groan, the sufferings of his vanquished enemies. But I will avow it to be my opinion, that the character of a great conqueror does not necessarily constitute that of a great man; nor can the recital of Cæsar's victories produce any other impression upon my mind than what proceeds from the contemplation of those convulsions of the earth, which in a moment inundate with ruin the plains of fertility and the abodes of peace; or, at one shock, convert whole cities into the graves of their living population!

But Cæsar's munificence, his clemency, his moderation, and his affectionate nature constitute him a great man! What was his munificence, his clemency, or his moderation?—the automaton of his ambition! It knew no aspiration from the Deity. It was a thing from the hands of the mechanician!—an ingenious mockery of nature! Its action seemed spontaneous—its look argued a soul—but all the virtue lay in the finger of the operator. *He* could possess no real munificence, moderation or clemency, who ever expected his gifts to be doubled by return—who never abstained, but with a view to excess; nor spared, but for the indulgence of rapacity.—*Knowles.*

SCROOGE AND MARLEY.

Marley was dead to begin with. There is no doubt whatever about that. The register of his burial was signed by the clergyman, the clerk, the undertaker, and the chief mourner. Scrooge signed it: and Scrooge's name was good upon 'Change, for anything he chose to put his hand to. Old Marley was as dead as a door-nail.

Mind I don't mean to say that I know, of my own knowledge, what there is particularly dead about a door-nail. I might have been inclined, myself, to regard a coffin-nail as the deadest piece of ironmongery in the trade. But the wisdom of our ancestors is in the simile; and my unhallowed hands shall not disturb it; or the country's done for. You will therefore permit me to repeat, emphatically, that Marley was as dead as a door-nail.

Scrooge knew he was dead? Of course he did. How could it be otherwise? Scrooge and Marley were partners for I don't know how many years. Scrooge was his sole executor, his sole administrator, his sole assign, his sole residuary legatee, his sole friend, and sole mourner. And even Scrooge was not so dreadfully cut up by the sad event, but that he was an excellent man of business on the very day of the funeral, and solemnised it with an undoubted bargain.

Scrooge never painted out Old Marley's name. There it stood years afterwards, above the warehouse door: "Scrooge and Marley." The firm was known as Scrooge and Marley. Sometimes people, new to the business, called Scrooge Scrooge, and sometimes Marley; but he answered to both names; it was all the same to him.

Oh! But he was a tight-fisted hand at the grindstone, Scrooge! a squeezing, wrenching, grasping, scraping, clutching, covetous old sinner! Hard and sharp as a flint, from which no steel had ever struck out generous fire; secret and self-contained, and solitary as an oyster. The cold within him froze his old features, nipped his pointed nose, shrivelled his cheek, stiffened his gait; made his eyes red, his thin lips blue; and spoke out shrewdly in his grating voice. A frosty rime was on his head, and on his eyebrows, and his wiry chin. He carried his own low temperature always about with him; he iced his office in the dog-days; and didn't thaw it one degree at Christmas.

External heat and cold had little influence on Scrooge. No warmth could warm, nor wintry weather chill him. No wind that blew was bitterer than he; no falling snow was more intent upon its purpose; no pelting rain less open to entreaty. Foul weather didn't know where to have him. The heaviest rain, and snow, and hail, and sleet, could boast of the advantage over him, in only one respect. They often "came down" handsomely, and Scrooge never did.

Nobody ever stopped him in the street to say, with gladsome looks, "My dear Scrooge, how are you? when will you come to see me?" No beggars implored him to bestow a trifle; no children asked him what it was o'clock; no man or

woman ever once, in all his life, inquired the way to such and such a place, of Scrooge. Even the blind-men's dogs appeared to know him; and when they saw him coming on, would tug their owners into doorways, and up courts; and then would wag their tails, as though they said, "No eye at all is better than an evil eye, dark master!"

But what did Scrooge care? It was the very thing he liked. To edge his way along the crowded paths of life, warning all human sympathy to keep its distance, was what the knowing ones called "nuts" to Scrooge.—*Charles Dickens.*

FRENCH READINGS.—No. XXXII.

LA CHARITE.

Section II.

L'ardente charité, que le pauvre idolâtre![a]
Mère de ceux pour qui la fortune est marâtre,[1]
Qui relève et soutient ceux qu'on foule en passant,[2]
Qui, lorsqu'il le faudra, se sacrifiant toute,[3]
Comme le Dieu martyr dont elle suit[b] la route,
Dira: Buvez! mangez! c'est ma chair et mon sang.
Que ce soit elle, oh! qui riches! que ce soit elle
Qui bijoux, diamants, rubans, hochets, dentelle,[4]
Perles, saphirs, joyaux, toujours faux, toujours vains,
Pour nourrir l'indigent et pour sauver vos âmes:[5]
Des bras de vos enfants et du sein de vos femmes
Arrache tout à pleines mains!

Donnez, riches! L'aumône est sœur de la prière,[6]
Hélas! quand un vieillard sur votre seuil de pierre,
Tout raidi[c] par l'hiver, en vain tombe à genoux;
Quand les petits enfants, les mains de froid rougies,[7]
Ramassent sous vos pieds les miettes des orgies,[d]
La face du Seigneur se détourne de vous.

Donnez! afin que Dieu, qui dote les familles,
Donne à vos fils la force, et la grâce à vos filles;[9]
Afin que votre vigne ait toujours un doux fruit;[10]
Afin qu'un blé plus mûr fasse plier vos granges;[11]
Afin d'être meilleurs; afin de voir les anges
Passer dans vos rêves, la nuit![12]

Donnez! il vient[e] un jour où la terre nous laisse;[13]
Vos aumônes, là-haut, vous font une richesse.
Donnez! afin qu'on dise: Il a pitié de nous![14]
Afin que l'indigent que glacent les tempêtes;
Que le pauvre qui souffre à côté de vos fêtes,
Au seuil de vos palais fixe un œil moins joloux.[15]

Donnez! pour être aimé de Dieu qui se fit[f] homme,[16]
Pour que le méchant même en s'inclinant vous nomme,[17]
Pour que votre foyer soit calme et fraternel;[18]
Donnez! afin qu'un jour, à votre heure dernière,
Contre tous vos péchés vous ayez la prière[19]
D'un mendiant puissant au ciel.

VICTOR HUGO.

Colloquial Exercise.

1. Comment le poète décrit-il la charité?
2. Que fait la charité?
3. Que fera-t-elle s'il le faut?
4. Qu'est-ce que la charité devra arracher à pleines mains?
5. Pourquoi devra-t-elle arracher ces objets?
6. Qu'est-ce que l'aumône?
7. Quand la face du Seigneur se détourne-t-elle?
8. Quand se détourne-t-elle encore?
9. Pourquoi le poète exhorte-t-il encore à donner?
10. Que dit-il de la vigne?
11. Que dit-il du blé?
12. Que dit-il des anges?
13. Que doit-il arriver?
14. Pourquoi doit-on donner?
15. Quels sont encore les effets de l'aumône?
16. Pourquoi encore doit-on donner?
17. Que dit l'auteur à l'égard du méchant?
18. Que dit-il du foyer?
19. Que dit le poète de l'heure dernière de l'homme charitable?

Notes and References.—*a.* idolâtre, *adores.*—*b.* from *suivre*; L. part ii., p 106.—*c.* raidi; this word is also written *roidi.*—*d.* orgies, *revels.*—*e.* il vient un jour, *a day is coming.*—*f.* se fit, *became*; from *faire*; L. part ii., p. 92.

EUDOXIE.

EPISODE DES GUERRES DE L'EMPIRE.

Section I.

THE'CLA et Eudoxie, d'une honnête famille de la Saxe, étaient restées[a] orphelines dès leur bas âge![1] Madame Offenheim, leur tante maternelle, les avait recueillies dans son domaine près de Dresde,[2] ou plutôt dans le domaine de son mari, vieillard plus que septuagénaire, qui eût été[b] son père, et qui, ayant conçu pour elle une tendre affection, l'avait demandée en mariage, parcequ'elle n'avait pas de fortune,[3] afin de pouvoir, tout naturellement, lui laisser un sort assuré.

Théela et Eudoxie, installées, aimées et choyées dans le château de M. Offenheim, par leur tante, qui leur fut d'abord une mère,[4] pour les soins dûs au premier âge, et bientôt une institutrice pour l'éducation[5] que réclame la jeunesse, les chères petites, grâce à tant de sollicitude et d'amitié, n'avaient pas eu le temps de se savoir[c] orphelines.

Depuis plus de dix ans, le petit château d'Offenheim était devenu, par l'amabilité de la châtelaine, le rendez-vous des personnes les plus distinguées et les plus agréables du voisinage;[6] de manière que Théela et Eudoxie, indépendamment d'une instruction et d'une éducation des plus soignées, étaient redevables à leur tante de tous les meilleurs plaisirs.[7] Jamais jeunes demoiselles n'avaient été plus heureuses et plus contentes de leur bonheur[e]....lorsqu'un soir Madame Offenheim les fit appeler auprès de son lit, où on la croyait retenue par une légère indisposition.

Mes enfants, leur dit-elle, ce n'est point une indisposition, ce n'est pas une maladie,[10] c'est la mort!.... Demain vous serez orphelines une seconde fois.....Un anévrisme[d] déjà ancien va tarir dans quelques heures les sources[e] de ma vie je le sens....j'avais caché la gravité de mon état à mon mari.....Pourquoi assombrir encore les ombres de sa vieillesse?[11]

Je ne vous en avais rien dit, mes chères petites. Pourquoi pâlir d'avance les roses de votre printemps? Quoique j'espère en la miséricorde de Dieu, je regrette cette vie où je vous laisse.[12] Je la regretterai moins, si vous me promettez de ne pas abandonner votre vieil oncle,[13] que les infirmités commencent à accabler, et que la solitude achèverait de briser.[f] Cependant, grâce à ses libéralités, je puis vous laisser à chacune vingt mille ducats de dot;[14] mais, si vous vous mariez, avant que Dieu ait rappelé votre oncle, promettez-moi d'imposer l'obligation de vivre avec lui,[15] comme première condition de votre mariage. Ce ne sera pas trop de vous deux pour remplir le vide de mon absence[16].... il m'aime tant!.... L'affection se mesure à l'étoffe du cœur qui aime,[17] et non au mérite de l'objet aimé.... Adieu!.... adieu!.... promettez, et laissez-moi seule avec le prêtre qui entre.

Et les deux jeunes filles jurèrent ce qui leur était demandé,[18] en inondant de larmes la main qui se levait encore pour les bénir.

La nuit même, cette sainte femme mourut.[19] La contrée entière fut en deuil; toute le monde pleura,[20] excepté M. Offenheim: il avait un trop violent désespoir,[21]

Colloquial Exercise

1. Quand Théela et Eudoxie étaient-elles restées orphelines?
2. Où leur tante les avait-elles recueillies?
3. Pourquoi M. Offenheim l'avait-il demandée en mariage?
4. Que fut d'abord la tante, envers les orphelines?

5. Que leur fut-elle bientôt ?
6. Qu'est-ce que le château d'Offenheim était devenu depuis dix ans ?
7. De quoi Théela et Eudoxie étaient-elles encore redevables à leur tante ?
8. Etaient-elles heureuses ?
9. Qu'arriva-t-il un soir ?
10. Que leur dit d'abord leur tante, de son indisposition ?
11. Pourquoi n'avait-elle pas communiqué son danger à son mari ?
12. Que dit-elle à l'égard de la vie ?
13. Qu'est-ce qui le lui fera moins regretter ?
14. Que dit-elle d'une dot ?
15. Quelle promesse demanda-t-elle aux jeunes filles ?
16. Que dit elle de son absence ?
17. Comment l'affection se mesure-t-elle ?
18. Que firent alors les jeunes filles ?
19. Quand Madame Offenheim mourut-elle ?
20. La regretta-t-on ?
21. Pourquoi M. Offenheim ne pleurait-il pas ?

NOTES AND REFERENCES.—*a.* L. S. 41, R. 2.—*b.* eût été, *might have been.*—*c.* de se savoir, *to know that they were.*—*d.* anévrisme, *tumor.*—*e.* sources, *springs.*—*f.* briser, *crush.*

SECTION II.

Cette mort fit une révolution complète[a] dans le château d'Offenheim,[1] qui devint[b] aussi triste et aussi désert[2] qu'il avait été animé. Le vieux chatelain, immobile de douleur, fut frappé d'une paralysie du bras droit ;[3] et il n'avait plus d'autre consolation que la vue et les soins de Théela et d'Eudoxie.[4]

Rien ne se ressemblait moins que les deux sœurs entre elles.[5] Théela, les yeux et les chevaux noirs, la taille haute et élancée,[6] avait le caractère altier, l'humeur vive et coquette, l'imagination plus ardente que le cœur. Eudoxie avait pour ainsi dire[c] l'âme blonde comme les cheveux ;[7] ses yeux bleu étaient doux et voilés comme son cœur ; un tendre nuage de mélancolie semblait envelopper son front et son esprit ; ses devoirs étaient ses premiers plaisirs.[8] Tout excitait les vœux de Théela ;[9] un rien[d] contentait ceux d'Eudoxie. Sans doute Eudoxie soupirait un peu de l'austérité de sa vie auprès de M. Offenheim,[10] mais, il lui avait été légué par sa tante,[11] et elle ne comprenait[e] pas pour elle-même un autre bonheur que de le rendre moins malheureux.

Théela, au contraire, supportait avec impatience un pareil assujettissement,[12] et ses rêves ne tendaient qu'aux moyens possibles de s'en affranchir.[13] C'était presque toujours Eudoxie qui soutenait[f] les pas du vieillard, qui lui faisait de saintes et intéressantes lectures,[14] et qui lui chantait les airs qu'il préférait, les vieux airs de sa jeunesse.[15] Elle était admirable de soins, de gaieté, de courage, et M. Offenheim avait retrouvé des larmes pour pleurer sa jeune épouse ;[16] c'était une grande joie pour Eudoxie.—Théela au contraire, avait presque toujours quelque bonne raison pour n'être pas près de M. Offenheim ;[17] il s'en apercevait bien,[18] mais il ne s'en plaignait[g] jamais ; il était trop bon, et aussi trop content de son Antigone-Eudoxie, qui trouvait d'ailleurs, mille excuses afin d'expliquer l'absence de sa sœur.[19]

Quelques mois étaient à peine écoulés, qu'il se présenta un riche mariage pour Eudoxie,[20] mais il fallait quitter le château d'Offenheim,[21] et ce mariage fut refusé. Au premier moment, Théela en avait conçu beaucoup de jalousie. Belle et brillante comme elle était, voir sa sœur cadette rechercher ainsi avant elle, son orgueil en souffrit cruellement ; depuis ce jour-là, elle ne cessait[h] d'écrire à Dresde,[22] aux connaissances qu'elle y avait contractées pendant les dernières années où l'on recevait tant de monde à Offenheim. Enfin, un matin arriva un courrier qui lui apportait la nouvelle qu'elle était nommée lectrice et demoiselle d'honneur de la reine.[23] Vite, elle porta la lettre à sa sœur, qui lui dit seulement : Et la promesse on lit de mort de notre tante ? Théela sans se déconcerter répondit : J'ai promis que je ne me marierais qu'à la condition de rester auprès de M. Offenheim.....Mais ce n'est pas pour me marier que je quitte ...Ainsi.....

COLLOQUIAL EXERCISE.

1. Quel fut l'effet de cette mort dans le château d'Offenheim ?
2. Que devint ce château ?
3. Qu'arriva-t-il au vieux châtelain ?
4. Quelle était la seule consolation qui lui restât ?
5. Les deux sœurs se ressemblaient-elles ?
6. Décrivez Théela ?
7. Veuillez nous décrire Eudoxie ?
8. Remplissait-elle ses devoirs ?
9. Que dit l'auteur des vœux de Théela ?
10. Eudoxie était-elle entièrement heureuse ?
11. Pourquoi avait-elle tant d'égards pour M. Offenheim ?
12. Comment Théela supportait-elle cette solitude ?
13. A quoi tendaient les rêves de la jeune fille ?
14. Que faisait Eudoxie près du vieillard ?
15. Que lui chantait-elle ?
16. Qu'avait retrouvé M. Offenheim ?
17. Que faisait alors Théela ?
18. S'en apercevait-il ?
19. Que faisait Eudoxie ?
20. Qu'arriva-t-il au bout de quelques mois ?
21. Pourquoi le mariage fut-il refusé ?
22. Que fit Théela depuis ce jour ?
23. Qu'arriva-t-il un matin ?

NOTES AND REFERENCES.—*a.* L. part ii., § 16, R. (4).—*b.* from *devenir ;* L. part ii., p. 88.—*c.* pour ainsi dire, *if we may use the expression.*—*d.* un rien, *a trifle.*—*e.* from *comprendre ;* L. part ii., p. 82.—*f.* soutenait, *supported.*—*g.* from *se plaindre ;* L. part ii., p. 98.—*h.* L. part ii., § 138, R. (2).

ANSWERS TO CORRESPONDENTS.

ADMIRER.—To begin the study of the Hebrew language, the student ought to obtain Arnold's First Hebrew Book ; having mastered this, Gesenius's Grammar and Reading Book will be found useful.

JAMES BARLOW HALL.—The rule in the English Lessons is right, and the instances to the contrary wrong, though they are not uncommon.

A YOUTH OF FOURTEEN.—Practice, under good tuition, or with good models, is the only way to improve your handwriting. Spirits of wine is used for spirit-lamps, and may be obtained of any chemist.

PUPIL.—Pronounce Latin as if it were English, observing the rule we gave with regard to accent, and making final *e* a distinct syllable, thus—*a-mór-e*, not *a-more*. To know whether a syllable is long or short, you must look in the dictionary, or *gradus* ; or, still better, read and *scan* (*i.e.* divide into feet) a good deal of verse.

ELLIVAS (Stepney).—Good German works are Schiller's, Goëthe's, Klopstock's "Messiah," Undine, Lessing's Fables, Schwabe's Poems, Tieck, Menzel's German Literature, and others. In French you may read Telemaque, Gil Blas, La Fontaine's Fables, Voltaire's "Charles XII.," Montesquieu, Racine, Corneille, Molière, Thierry, Thiers, Guizot, Louis Blanc, &c. We cannot assist you in the other matter. Probably some optician might furnish you with the information you want.

A LOVER OF LANGUAGE.—Thanks for your Greek trees. They are now generally held to be more curious than useful, because scarcely any verb forms a very tense of every voice. The Hebrew points are rather an innovation than an adulteration, having been introduced into MSS.—according to the opinion of the best scholars—somewhere between the sixth or seventh and tenth or eleventh centuries of the Christian era. Certainly they are not found in ancient versions, nor do they appear to have been known to the old commentators, such as Jerome and others.

TAU.—For information on the subject of Euclid's twelfth axiom, see "Cassell's Euclid," "Cassell's Self-Examiner in Euclid," or our Lessons in Geometry. It is impossible to define exactly how much classical knowledge a man should have before matriculating at Cambridge. He should, at least, be able to read Xenophon, Homer, Livy, Virgil, and Horace with tolerable ease. In mathematics he ought to be well acquainted with arithmetic, algebra, Euclid, and trigonometry. Of course, the more he knows of both classics and mathematics, the better.—Consols are portions of the National Debt *consolidated* at a certain rate of interest ; *i.e.*, the Government having, at different times, borrowed money on various terms, put all the sums together and agreed to pay the same interest for the whole. As the value of any debt must vary with the probability of its payment, and the general state of commerce, so that of the National Debt changes according to the circumstances which affect the condition of the Government and the country. Hence the daily alterations in the prices of consols, shares, and other securities.

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LESSONS IN GEOLOGY.—No. LIX.

By Thos. W. Jenkyn, D.D., F.G.S., F.R.G.S., etc.

CHAPTER V.

ON THE CLASSIFICATION OF ROCKS.

SECTION XI. *(continued.)*

ON THE COAL MEASURES.

§ II. THE ORGANIC FOSSILS OF THE COAL FORMATION.

The carboniferous group of rocks is, of all geological formations, the most abundant in fossils. The Mountain Limestone abounds in shells. The Coal Measures are rich in plants. The Millstone Grit, though the least fossiliferous, comes in for a share in the coal plants.

The millstone grit is sometimes considered merely as one of the coal sandstones, accompanied with shales that contain vegetable fossils. It has already been pointed out that, in the north of England coal fields, some bands of limestone containing oysters, pectens and other marine shells, occur in this grit.

But the most fossiliferous beds in this formation are coal measures and the mountain limestone.

For the present, it is assumed that coal is of vegetable origin—an assumption which will be established by facts in our next "Lesson." In this lesson, we shall survey the coal fossils just as we find them.

I. COAL PLANTS.

1. The kinds and forms of vegetables found in the coal beds are very numerous, and what is remarkable is, that these kinds of plant are uniform in every part of the carboniferous system, both in the Old World and in the American Continent. According to the enumeration of Unger, the coal measures contain the fossils of 683 species of plants. Though this number looks large, it is small, and forms but one-twentieth of the number of species now growing in Europe only: yet though the number of species be comparatively scanty, the number of individuals of each species must have been enormous and extensive.

2. The engraving below will give an idea of the class of plants and trees that luxuriated in the coal period. The sight of it is sufficient to show that the condition of the vegetable world was, at that time, of a very different character from what it is now.

3. Ferns.—In the whole group of the coal forest, the ferns are the only plants that present an obvious relation to plants of the present creation. The majority of the fossil ferns are supposed to be of the size of a common fern of the present day in our own country, especially those of rank growth; but in very many instances they were ferns of the size and height of some of our trees, and are therefore called *tree ferns*. See A A A in fig. 17.

Though ferns are hardy plants, and are capable of retaining their structure in the coal shales, the fossil ferns very rarely present any marks of their fructification. On this account, palæontological botanists have found it exceedingly difficult to divide them into their respective species. They have therefore been classified according to the branching of their fronds or leaves, and according to the manner in which the veins in the leaves are arranged. On these principles they have been named thus:

Pecopteris, or the embroidered fern.
Neuropteris, or the nerved-leaf fern.
Sphenopteris, the wedge-leaf fern.
Cauloptenis, the fern stem.
Cyclopteris, the round-leaf fern.

All these are beautifully figured in Mantell's "Medals of Creation," vol. i.

Fig. 17. An ideal Forest of the Coal Period.



A. *Tree Ferns.* B. *Lepidodendron.* C. *Sigillaria.* D. *Asterophyllites.*

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The tree ferns which grow in the present day belong to the tribe of plants called Polypodiaceæ. When the fronds of this class of ferns fall off, they leave upon and along the surface of the trunk scars or cuts, just like those which are found marking the fossil *Caulopteris*, which were also occasioned by the decay of the leaf-stalks.

The fern tribe must have been very abundant and rank in the coal period, for very nearly 300 species have been enumerated as coal fossils. This is remarkable when it is considered that the whole of Europe, in its present vegetation, furnishes only fifty indigenous species.

4. Sigillaria.—There is perhaps no plant in the coal formation of so much importance as the Sigillaria. It derives its name from the beautiful and well-defined impressions which are made upon it, and which seem as if they had been produced by a Sigillum, the Latin for seal. Most of the coal trees belonged to this class, of which sixty different species have been discovered and determined.

These Sigillariæ are found in all coal shales in every part of the globe. They grew in lofty stems of from forty to fifty and even to seventy feet high, in cylindrical trunks from one to five feet in diameter, their surface fluted, and generally without branches. Botanists have determined that the Sigillariæ belonged to the family of cone-bearing trees, akin to the fir, etc., and that in their internal organisation they are related to the species called *Zamiæ* and *Cycadeæ*.

Amid the layers of the coal shales, the Sigillariæ are frequently found in the form of long, flat, narrow slabs of a coaly substance, with both surfaces fluted in the line of their length. These fluted surfaces are marked and ornamented with rows of distinct and deep figures, all of which are disposed with perfect regularity. These are stems of *Sigillariæ* flattened by the weight of overlying beds. The inside of their wood seems to have decayed very rapidly. On this account they have become hollow, and consequently, when they have been thrown down lengthwise in the mud, they were the more easily flattened by the pressure from above. The appearance of the different kinds of Sigillariæ is represented in fig. 18.

In the *Sigillaria Oculata*, the fluting of the stem is very distinct, and the imprints or little pits marked on the surface look like the *eye* of an animal, and hence its name. The *Sigillaria Voltzii* has an outward lamination like bark, that has its appropriate markings, and that separate from the inner surface, whose impressions differ from the outward one. This difference is exhibited in the lower and the upper parts of the specimen B in the wood-cut. The *Sigillaria Elegans*, C, has a woody system, divided into long hexagonal or six-sided plates, which are dotted with circular pits.

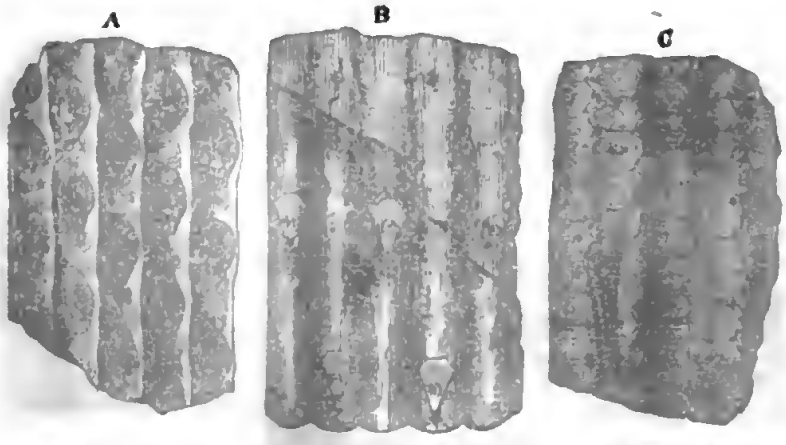
Sometimes the Sigillaria is found in the coal measures in an oblique or upright position, just as the tree grew. This is represented by C in our engraving of the coal forest. In these circumstances, they retain the rounded form of their original structure; but their cylindrical bark, now carbonised, has been filled with sand, which has hardened, and which, when removed, presents a cast of the inward structure.

5. Stigmaria.—You have already been told that the under clays, which form the floor of the coal seams, contain a vegetable fossil called Stigmaria, and that it contains no other fossil. These Stigmariæ are always found in their natural form, and branching out through the muddy shales in all directions. Geological botanists were a long time in determining the real character of these fossil plants, and it was not till their regular position under the coal seams was ascertained, that a clue was given to the discovery that they were the roots of the tree called Sigillaria. Before this, they were supposed to be aquatic plants, or floating shrubs, which settled in the mud, and were afterwards covered over by the continued succession of deposits.

The discovery that Stigmaria was the root of Sigillaria was made by Mr. Binney, in the coal-works at St. Helen's, near Liverpool, where both were in immediate contact, as root and stem, as represented in fig. 19.

When Stigmaria is called the root of the Sigillaria, it is meant that it is its rhizome, a term which botanists use for a root-like stem creeping horizontally, more or less covered with earth, like those of the elm in thin soils, and giving off buds and rootlets like the specimen B in fig. 19. The bodies of these roots are, as the illustration shows, of a cylindrical form, which, in length, are from a few inches to many feet, and in circumference from ten to twelve inches. There have been instances in which the roots spread themselves to the distance of sixteen feet. Some of these roots, as is seen in D, put forth rootlets, which were fitted on, to tubercles that were in the bark, spirally around each root. In D, you see some of these rootlets attached above and below, and the circular markings are the small pits left by the dropping off of the rootlets; and in E you are presented with the symmetrical structure of those markings. When a specimen of Stigmaria is broken across, a small circular body or core, represented by the inward circle and black spot on the right end of D, is found; and the more it is traced, the more clear is it that this core or axis extends the whole length of the stem, and yet it is very rarely in the centre, but generally on one side of the root.

Fig. 18. *Sigillariæ.*



A. *Sigillaria Oculata.* B. *Sigillaria Voltzii.* C. *Sigillaria Elegans.*

6. Lepidodendron.—This term means the *scaly tree*, and it is called "scaly" from the scars which are left on the stem by the falling off of the leaf-stalks. The Lepidodendron's form of growth is represented by B B B in our engraving of the coal forest. These trees grew to the height of from twenty to about fifty feet. In Jarrow Colliery, near Newcastle-upon-Tyne, a specimen, forty-nine feet long, was found lying in layers of shale prostrate along the line of lamination.

Specimens of the fruit of the Lepidodendron have been discovered in several coal-fields. These are elongated bodies,

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like a cucumber, and have been called fossil cones. Geologists call this fruit *Lepidostrobus*, which is a Latin compound for scaly cone. This fruit is often found to have formed the nucleus of the concretion called clay-iron-stone. In this concretion, the form of the fruit is well preserved, exhibiting a conical core or body, covered all around with innumerable scales, enclosing sporangia, or the spores of the plant.

7. Equisetum and Calamites. The Equisetum, or the Calamites [ca-la-mi'-tes], is a reed-like fossil plant, much akin to the *Horsetail*, which grows in marshy places. Its stem is cylindrical, furrowed and jointed, not unlike that of Tree Sigillaria, c, in fig. 17. The tallest horsetail in our present marshes in Europe grow only two or three feet high, and even the *Equisetum giganteum* of the tropics of South America, only about five feet, with a stem of about an inch in diameter; but during the epoch of the Coal Formation, these Calamites had the dimensions of trees—twenty or thirty feet high.

The stems of the Calamites are frequently found crushed and flattened, which implies that they grew hollow. They appear to have had a bark which could be easily separated from the wood. Fifty-one different species of Calamites have been determined, and what used to be called the leaves and the branches of those plants have been ascertained to be their plant, or the star-leaf. This graceful plant is represented by D in the engraving of the coal-forest, and which appear to grow under the shade of the Lepidodendra of that wood-cut.

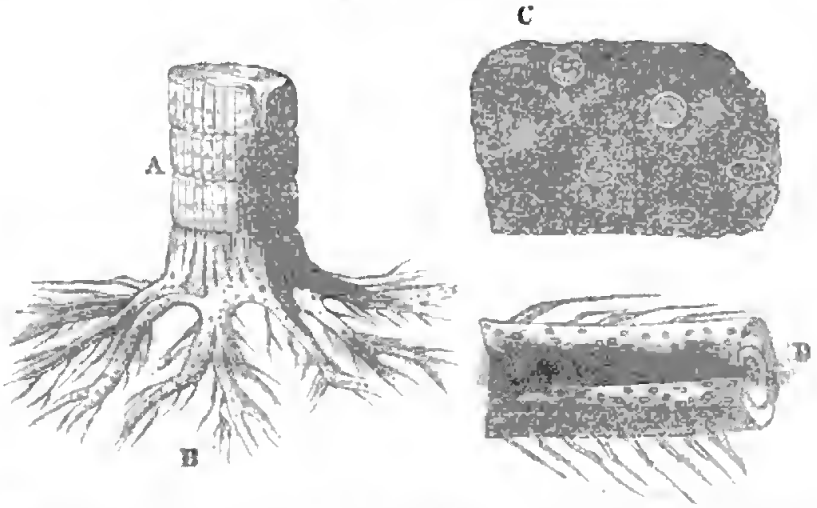
9. Club-mosses. The Club-mosses are small herbaceous plants that grow among brushwoods and in bogs, and their leaves grow over one another, as in the lettuce-plant. In the present vegetation of the earth, there are about two hundred species of club-mosses, which abound most in tropical climates, where one species grows even so high as three feet. These mosses, however, in the coal period grew to be gigantic plants, or rather trees, like the largest firs, and formed a dense and extensive forest, under the shade of which grew the lesser ferns and mosses.

II. COAL SHELLS AND FISHES.

In some of the gritty sandstones and clayey shales associated with the coal measures, but especially in the beds of the Mountain Limestone, many remains have been found of animated organisms.

1. The Mountain Limestone is rich in zoophytes or animal plants, and in corals of several species. Entire beds of this rock are frequently formed of swarms of Crinoides, or lily-shaped plants.

Fig. 19. *Stigmaria.*



A, *The trunk of a Sigillaria in contact with* B, *the Stigmaria, as its root.* C, *A fragment of Stigmaria, with its eyelet markings, magnified.* D, *A piece of Stigmaria ficoides.*

roots. The vast abundance of them in the coal measures indicates that they constituted an essential part of the flora of the coal period.

The exposure of the coal measures has often presented sections which exhibited the stems of the Equiseta in an erect position, the very attitude in which they grew. They have been thus seen by Mr. Binney in the Lancashire coal-fields, and by Sir Charles Lyell at Pictou, in Nova Scotia; but one of the most remarkable of such sections is the one seen by M. Alex. Brogniart [Brón-yar] in the coal-works of St. Etienne, near Lyons, in France, and which is exhibited in fig. 20.

This engraving teaches us many important geological lessons. First: that the different beds of micaceous sandstone gathered, in the form of mud, around these stems while they were growing. Secondly: the different elevations at which the bottoms of these stems are found show that the plants grew at different elevations, and that, consequently, we have here a succession of submerged forests. Thirdly: the continuity of some of the stems being broken or pushed to one side, indicates that, after the sandstone beds had been hardened, a sliding movement took place in the strata.

8. Asterophyllites. The Asterophyllites are slender plants, which are called by this name because their leaves radiate about like the rays of a star—the star-like-leaved

2. The shells of the coal series amount to about three hundred different species, some of which are microscopical. Of these fossil shells, some are of fresh-water origin, and others—the majority—are of sea growth, while a third class is of brackish water. The fresh-water and the brackish water shells are found in the grits and clays of the coal measures, and have been called the mussel-bands. In the neighbourhood of Shrewsbury there is a gritty deposit, formed probably in brackish water, and generally supposed to be the newest member of the coal series, that is characterised by a small bivalve shell like a *Cyclas*, and by a diminutive Cypris. At Cape Breton, in Nova Scotia, also the strata associated with the coal seams have various shells, such as *Cypris*, *Unio*, *Modiola*, and *Spirorbis*, all of which are indicative of brackish water.

In some cases, an intercalation of fresh-water and sea shells is found. Thus, in the Edinburgh coal-field, the remains of sea fishes are found associated with the Cypris, a brackish water shell, like that of the Shrewsbury bed. In Yorkshire, also, the fresh-water beds contain the shells of the *Unio*; and yet, in the midst of this series, there is an extensive bed abounding in fishes and in marine shells. In the Coalbrook Dale coal-fields, the strata have afforded forty or fifty species of terrestrial plants, and also about forty species of shells, of which two or three are allied to the fresh-water *Unio*, and the

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others are sea shells, such as *Nautilus*, *Spirifer*, *Orthoceras*, etc.

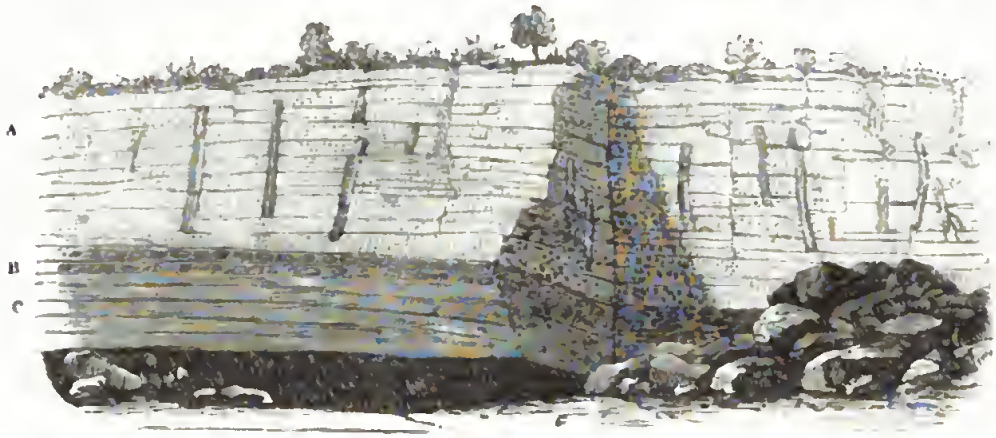
3. The sea tribes of shells are in a great measure confined to the Mountain Limestone, which forms the basis of the coal formation. This rock, as has been intimated, is frequently crammed with corals, often of a large size, and allied to the class which are forming coral reefs in our present seas. Among the bivalve sea shells, the greatest portion are referred to the two extinct genera called the *Spirifer* and the *Productus*. The *Pecten*, or scallop, appears for the first time in great numbers, presenting about seventy different species. It contains also many fossil univalves related to existing genera, such as the *Turritella Buccinum;* but the most common univalve in it is the extinct genus *Euomphalus*, that coils its shell around itself like the ammonite. One remarkable fossil in this rock is the *Bellerophon*, a shell that is not found in any group that is newer than the coal formation.

III. COAL REPTILES.

1. Geologists had examined the different beds of the coal system, for about half a century, without discovering that any animal higher than a fish, or any creature that could live in the air, had existed at the coal epoch. To all that time no animal with a backbone, except a fish—no creature bringing forth its young alive—no frogs, no tortoises, no snakes, no lizards—nothing that could breathe air, except a few insects and two species of beetles, had been discovered in rocks so ancient as those of the coal. The first clue to the probable existence of air-breathing animals was furnished by a singular tooth, found in the cannel coal of the Fifeshire coal-fields. The animal to whom this tooth belonged seemed to have been a true fish, but its tooth indicated that some parts of its organisation were higher than those of a mere fish.

2. In 1844, the upper part of the skeleton of a true reptile was discovered in the coal-fields of Rhenish Bavaria, which was called *Apateon pedestris*. In 1847, the coal-works of Saarbrück, near Strasburg, furnished the skeletons of three distinct species of reptiles, which were classified under one genus called *Archegosaurus*. There can be no doubt that these reptiles belonged to the coal period, for the plants and the fish found in the same strata were those of the true carboniferous epoch.

Fig. 20. The upright Stems of Equiseta, or Calamites, in the Coal Measures at Treuil, by St. Etienne, near Lyons.



A, *Horizontal beds of sandstone, traversed by erect trunks of tree-like bamboos or Equiseta.* B, *Coal shales with impressions of plants.* C, *Shales with nodules of clay-iron-stone.* D, *A layer of sandstone.*

ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXVI.

(*Continued from page* 195.)

ELECTRO-DYNAMICS.

Mutual Action of Electric Currents.—In a previous lesson we gave a brief summary of the principles established by Ampère in reference to electro-dynamical attraction and repulsion. We now propose to enter into a more detailed consideration of some of them.

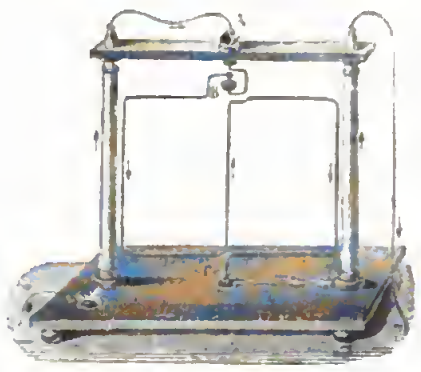
When two metallic wires near together are traversed by one electric current at the same time, certain attractions and repulsions between the wires are produced, analogous to those in operation between the poles of two magnets. These phenomena, which were discovered by Ampère soon after Œrsted's discovery already referred to, constitute a branch of dynamical electricity known by the name of electro-dynamics. The laws which regulate them present different cases, according as the currents are parallel or angular, rectilinear or curvilinear.

Laws of parallel currents.—1. *Two parallel currents in the same direction attract each other.*

2. *Two parallel currents in contrary directions repel each other.*

To demonstrate these laws, divide the circuit through which the current passes into two parts, the one fixed and the other moveable, as shown in fig. 440. The fixed part consists of two copper columns placed vertically on a flat piece of wood. The positive electrode of a pile of four or five Bunsen couples, being connected with the foot of the column on

Fig. 440.

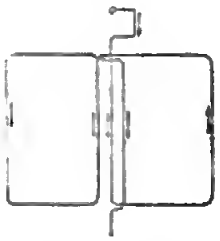


the left of the figure, the current ascends in this column, goes along a wire A, and thence into a capsule B containing mercury.

From this point commences the moveable part of the circuit, which consists of a red copper wire, one end of which rests by means of a pivot upon the capsule B, and the other dips into a second capsule C, from which the current rises in the column on the right, which is connected at the top with the negative electrode of the pile. The arrangement of the arrows shows that the current proceeds in contrary directions in the columns and in the moveable circuit. Now this latter, which is carefully placed in the plane of the axes of the columns before the passage of the current, recedes from it by turning on its pivot B, as soon as the current passes, which proves the second law.

To demonstrate the first, remove the moveable circuit in fig. 440, and substitute in its stead that represented in fig. 441.

Fig. 441.



The current being then in the same direction in the columns and in the moveable part of the circuit, attraction is proved to exist, for the moveable circuit always returns to the plane of the axes of the columns directly after it is removed from it.

Laws of angular currents.—1. *Two rectilinear currents, the directions of which form an angle, attract each other when they both approach or recede from the vertex.*

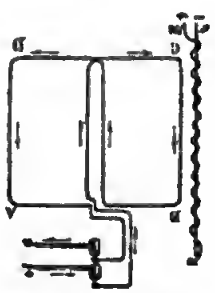
2. *They repel each other, if one approaches the vertex while the other recedes from it.*

These laws are demonstrated by passing the current simultaneously along two horizontal wires near to each other, the one fixed and the other moveable, and the two being inclined at an angle. This angle then decreases or increases, according as the two currents have the same or a contrary direction in relation to the vertex or point of intersection, that is to say, the two currents always tend to become parallel and in the same direction.

Ampère inferred from the second of the above laws that an angular current tends to become straight, and that *in a rectilinear current, each element of the current repels the next one and is repelled by it.* The demonstration of this principle is usually attempted by showing that, when the current passes from a mercury bath along a thin copper wire which rests upon the surface of the mercury, this wire is repelled; but the resistance resulting from the change of the conductor may suffice to produce the phenomenon.

Law of curvilinear currents.—The action of a curvilinear current is the same as that of a rectilinear current equal in length to the

Fig. 442.

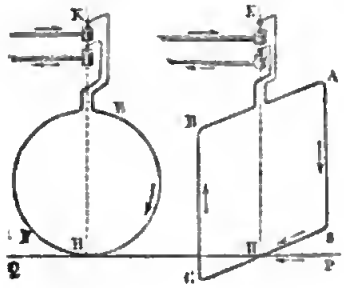


projection of the curve.—This principle is demonstrated by arranging a current m n o, half curved and half rectilinear, near a moveable current a c o d, fig. 442. Neither attraction nor repulsion is then observable, which shows that the action of the curved portion m n is in equilibrium with the rectilinear portion n o.

When we come to speak of electro-magnetism, we shall see that the earth has a directive action upon currents; but we shall also see that, by their form, the currents represented in figs. 440, 441 and 442 are withdrawn from this action.

Directive Action of an Indefinite Current upon a Finite one.—A B C D being a rectangular current, moveable about a vertical axis K H, fig. 443, and P Q a horizontal current that is fixed

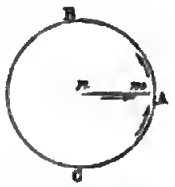
Fig. 444. Fig. 443.



and indefinite, *the fixed current tends to bring the moveable current into a position parallel to* P Q, *and such that, along the wires* D *and* P Q, *the direction is the same.* This principle, which may be demonstrated by experiment, is a consequence of the two principles stated above in reference to angular currents. It is easy to see, in fact, from the direction of the currents along the wires P Q and A D C B, that the portion P H of the fixed current acts by attraction upon the parts A D and D H of the moveable current, for both the currents move so as to approach each other. The portion H Q also acts in the same way upon the parts B C and H C of the moveable currents, for both the currents move so as to separate from each other. The moveable current, therefore, tends to come into a plane parallel to P Q, in such a manner that in O N and P Q the currents may be in the same direction. If, when the moveable current went always in the direction of the arrows, the fixed current proceeded from Q to P, all the above attractions would be changed into repulsions, and the moveable current, after having performed a semi-revolution, would still come into a plane parallel to P Q, so that in the part O D the current would be in the same direction as the current Q P. The same principles apply to the circular current E F, fig. 444.

Rotation of Currents by means of Currents.—The attraction and repulsion going on between angular currents may easily be transformed into a circular movement. Let two currents be placed in a horizontal plane, the one A B C, fig. 445, fixed

Fig. 445.



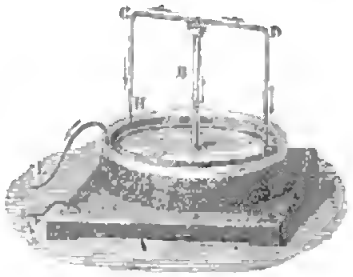
and circular, the other m n rectilinear and moveable about the centre n. These currents, being in the same direction as the arrows, attract each other in the angle n A C, for they both go towards the vertex. In the angle n A B, on the contrary, they repel each other, for the one goes towards the vertex and the other from it. The two effects, therefore, concur to turn the wire m n constantly in the direction A O B.

Several apparatus have been devised for producing the rotation of a current by means of a current. That represented in fig. 446, consists of a glass vessel, round which is coiled a copper wire covered with silk, and traversed by a fixed current. In the centre of this vessel is a copper column B, terminated by a small capsule containing mercury. Into this mercury is plunged an iron pivot, which supports a red copper wire D Q, bent vertically in the direction of the branches D K and O H.

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Lastly, these two branches are soldered to a red copper ring *m*, which dips into the acidulated water contained in the vessel. After having entered the wire at the end A, and made several revolutions round the vessel, the current goes below it to the lower part of the column B, ascends the column, reaches the wire C D, the ring *m* and the acidulated water, into which is plunged the negative electrode B of the pile whose positive

Fig. 446.



pole is connected with the wire A. The current being thus closed, the whole moveable system K D C H *m* begins turning in a direction contrary to that of the fixed current. This motion is explained by the action of the fixed current upon the two currents descending along the branches O K and C H.

Electro-Dynamical Cylinders.—The term *electro-dynamical cylinders* is employed by Ampère to denote a system of circular, equal and parallel currents formed of one and the same copper wire, covered with silk, and wound round itself like a helix or spiral, as represented in fig. 447. An electro-dynamical cylin-

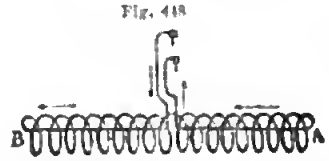
Fig. 447.



der, however, is not complete unless a part B c of the wire is brought back through the spiral circles so as to form an axis within the helix, according to the representation of the figure. With this arrangement, when the circuit is traversed by a current, it follows, from what has been already stated with regard to curvilinear currents, that the action of the electro-dynamical cylinder in the direction of the curved portion A B, is destroyed by that of the rectilinear currant B C. This action is, therefore, null in the direction of A B, and consequently the effect of the dynamical cylinder, in a direction perpendicular to the axis, is exactly equal to that of a series of circular, equal and parallel currents.

Action of Currents upon Electro-Dynamical Cylinders.—As what has been said of the action of rectilinear fixed currents upon finite rectangular or circular currents, evidently applies to each of the circuits of an electro-dynamical cylinder, it follows, that a rectilinear current must tend to make these currents parallel to itself. To establish this by experiment, construct the electro-dynamical cylinder as represented in fig. 448, so as to be able to suspend it by two pivots upon the cups

Fig. 448.

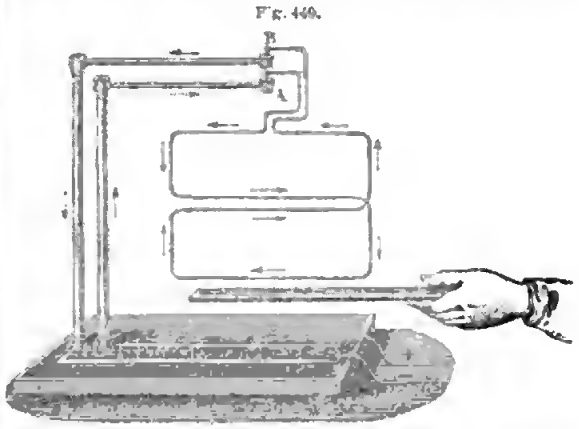


A and B of the apparatus represented in fig 449; the electro-dynamical cylinder is then perfectly moveable about a vertical axis, and if we direct a rectilinear current below it, parallel to its axis, and which passes at the same time through the cylinder, we shall see the cylinder turn and come into a position at right angles with the current, that is to say, in a position such that its circuits are parallel to the fixed current, and further, in the lower part of each of the circuits the current is in the same direction as in the rectilinear wire.

If, instead of passing a rectilinear current horizontally below the cylinder, we pass it vertically by the side, we shall observe attraction or repulsion, according as the two currents in the vertical wire and in the part of the cylinder nearest to it are in the same or contrary directions.

Mutual Action of Electro-Dynamical Cylinders.—On making one of two electro-dynamical cylinders traversed by a sufficiently powerful current act upon the other, the former being held in the hand, and the latter moveable about a vertical axis passing through its centre, phenomena of attraction and repulsion, identical with those presented by the poles of magnets,

Fig. 449.



are observable at the extremities of the two cylinders. These phenomena are explained by the relative direction of the currents in the extremities brought together. We shall hereafter see that the same phenomena of attraction and repulsion are produced between electro-dynamical cylinders and magnets as between magnets themselves.

ELECTRO-MAGNETISM.

Action of Currents upon Magnets.—Under the mutual influence of currents and magnets, the same phenomena of attraction, repulsion and rotation are produced as are observed between currents. That part of physics or natural philosophy which treats of these mutual actions between currents and magnets is called *electro-magnetism*, and may be regarded as an appendage to electro-dynamics.

The actions which currents exert upon magnets are of two sorts—the one directive, and the other attractive or repulsive. We have already shown that the directive action of a current upon a magnet consists in *the current's always tending to bring the magnet at right angles with it, its south pole being on the left of an observer supposed to be lying in the current, so that as he looks to the magnet, the current enters at his feet and goes out at his head.*

The intensity of the directive action of the currents upon the magnetised needle varies with the distance. From the number of oscillations made by the needle at unequal distance, under the influence of a rectilineer current, Messrs. Biot and Savart found that *the intensity of the resultant of the directive actions of all parts of the current upon the needle is in inverse proportion to the distance.*

With regard to the attractive or repulsive action of currents upon magnets, it is established by hanging, vertically, a magnetised sewing-needle attached to a very fine silk thread. Then pass a horizontal current near the needle. Attraction or repulsion will very soon be observed, according to the direction of the current, which may be explained by the action of currents upon electro-dynamical cylinders, if we compare magnets with electro-dynamical cylinders, as Ampère has done in a theory to which we shall call the reader's attention shortly.

Directive Action of Magnets upon Currents.—The directive action going on between currents and magnets is mutual. In Œrsted's experiment, which we have already explained, the magnetised needle being moveable, while the current is fixed, the needle is brought at right angles with the current. If, on the contrary, the magnet is fixed and the current moveable, it is the latter which moves till it is at right angles with the magnet,

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the south pole always being on the left. To demonstrate this principle, arrange the experiment as shown in fig. 449. The circuit through which the current passes is moveable, and underneath its lower branch a strongly magnetised bar is brought near. The circuit immediately begins to turn, and stops after some oscillations in a plane perpendicular to the magnet, so that the south pole is on the left of the current in the lower part of the circuit.

The rotatory motion of a moveable current about a magnet is easily and beautifully shown by means of mercury. If the conducting wire from one of the poles of a battery terminate in a circular copper ring immersed in a shallow basin of mercury, and the end of the wire from the other pole be dipped into the mercury at a point near the centre of the ring; then the convergent or divergent currents between the ring and the centre will give rise to rapid rotation of the mercury, whenever the pole of the magnet is brought near to that centre, either above or below the basin.

BIOGRAPHY.—No. XVII.

DAVID HUME.

By J. R. Beard, D.D.

How much style may do to make an author immortal, is seen in the history of David Hume. The chief monument of his fame, his "History of England," is now known to labour under serious defects and numerous inaccuracies; his conception of the nature of his task falls far short of perfection, and the execution of his plan is rather popular than philosophical. Yet does his work retain its place on our shelves, and, what is more important, it is often found open on our tables. To live, an author must be read. Hume is read notwithstanding his shortcomings. There is a charm in his narratives which makes his volumes favourites. You can hardly open one of them but you fall on some passage which detains your eye and repays your attention. Far less of a scholar than Johnson, and with a lower position on the ladder of literature, Hume is far more read and has a far better prospect of a living immortality.

David Hume, born in Edinburgh the 26th of April, 1711, was the younger son of a Scottish laird, belonging to the family of Home. At an early period he felt himself drawn to classical literature and philosophy, yet his health, injured by severe study, and the narrow means of his family, occasioned his becoming a learner in "the art and mystery" of commercial life, which he studied in the then flourishing city of Bristol. Soon weary of a pursuit for which he had as little taste as aptitude, he returned to his native city, where he resumed his academical studies; on the termination of which he went to France. There, while pursuing his self-culture, he wrote a critical and psychological essay, the "Treatise upon Human Nature" (3 vols. London, 1738-40), the publication of which was followed by his "Essays, Moral, Political, and Literary" (Edinburgh, 1742). In 1745 he took on himself the delicate office of tutor to the young Marquis of Annandale, whose mind was none of the strongest, and became secretary to General Sinclair on his expedition to the French coast and his embassy to Vienna and Turin, after having been foiled in his attempt to gain the chair of Moral Philosophy in the Edinburgh University. In 1751, after his return to Scotland, Hume put forth his "Inquiry concerning the Principles of Morals." There also appeared from his pen, "Political Discourses" (1752); a collection of "Essays and Treatises on several Subjects" (1755); and the "Natural History of Religion," written in that sceptical spirit which marks too much of what fell from his pen, and which characterises the age. His appointment, in 1752, as superintendent of the Advocates' Library in Edinburgh, led to those investigations and studies which issued in his great historical compositions. He first wrote (1754-6) the "History of England under the Stuarts," in which he unconsciously gave a proof how a well-read man may misunderstand and misinterpret facts, and by his colourings and perversions there affords a warning against undue reliance on the statements and views which he puts forward on religious and moral topics. Following up this portion with a "History of the House of Tudor" (1759), he published a view of our history (1761) in its earlier periods. In 1763 the entire work appeared as a "History of England from the Invasion of Julius Cæsar to the Revolution of 1688." In the year 1763, Hume, now a great name, accompanied the Earl of Hertford as Secretary of Embassy to Paris. On his return he was honoured (!) with the appointment of Under-Secretary of State (1767). This office he soon laid down: the shadows of evening were gathering around him. He died in Edinburgh, Aug 25th, 1776. After his death his interesting autobiography made its appearance (1777), as well as "Dialogues concerning Natural Religion" (1779). See John Hill Burton's "Life and Correspondence of David Hume" (Edinburgh, 1842, 2 vols. 8vo). The following will afford some idea of Hume's ability and manner.

THE ANCIENT BRITONS.

"All ancient writers agree in representing the first inhabitants of Britain as a tribe of the Gauls or Celtæ, who peopled that island from the neighbouring continent. Their language was the same; their manners, their government, their superstition, varied only by those small differences, which time or a communication with the bordering nations must necessarily introduce. The inhabitants of Gaul, especially in those parts which lie contiguous to Italy, had acquired, from a commerce with their southern neighbours, some refinement in the arts which gradually diffused themselves northwards, and spread but a very faint light over this island. The Greek and Roman navigators or merchants (for there were scarcely any other travellers in those ages) brought back the most shocking accounts of the ferocity of the people, which they magnified, as usual, in order to excite the admiration of their countrymen. The south-east parts, however, of Britain, had already, before the age of Cæsar, made the first and most requisite step towards a civil settlement; and the Britons, by tillage and agriculture, had there increased to a great multitude. The other inhabitants of the island still maintained themselves by pasture: they were clothed with skins of beasts. They dwelt in huts, which they reared in the forests and marshes, with which the country was covered; they shifted easily their habitation, when actuated either by the hopes of plunder, or the fear of an enemy; the convenience of feeding their cattle was even a sufficient motive for removing their seats; and as they were ignorant of all the refinements of life, their wants and their possessions were equally scanty and limited.

"The Britons were divided into many small nations or tribes; and being a military people, whose sole property was their arms and their cattle, it was impossible, after they had acquired a relish for liberty, for their princes or chieftains to establish any despotic authority over them. Their governments though monarchical, were free, as well as those of all the Celtic nations; and the common people seem even to have enjoyed more liberty among them than among the nations of Gaul, from whom they were descended. Each state was divided into factions within itself: it was agitated with jealousy or animosity against the neighbouring states: and while the arts of peace were yet unknown, wars were the chief occupation and formed the chief object of ambition among the people.

"The religion of the Britons was one of the most considerable parts of their government; and the Druids, who were their priests, possessed great authority among them. Besides ministering at the altar, and directing all religious duties, they presided over the education of youth; they enjoyed an immunity from wars and taxes; they possessed both the civil and criminal jurisdiction; they decided all controversies among states as well as among private persons, and whoever refused to submit to their decree was exposed to the most severe penalties. The sentence of excommunication was pronounced against him; he was forbidden access to the sacrifices or public worship; he was debarred all intercourse with his fellow-citizens, even in the common affairs of life; his company was universally shunned, as profane and dangerous; he was refused the protection of law; and death itself became an acceptable relief from the misery and infamy to which he was exposed. Thus the hands of government, which were naturally loose among that rude and turbulent people, were happily corroborated by the terrors of their superstition.

"No species of superstition was ever more terrible than that

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of the Druids. Besides the severe penalities which it was in the power of the ecclesiasties to inflict in this world, they ineulcated the eternal transmigration of souls, and thereby extended their authority as far as the fears of their timorous votaries. They practised their rites in dark groves or other secret recesses; and in order to throw a greater mystery over their religion, they communicated their doctrines only to the initiated, and strictly forbade the committing of them to writing, lest they should at any time be exposed to the examination of the profane vulgar. Human sacrifices were practised among them; the spoils of war were often devoted to their divinities; and they punished with the severest tortures whoever dared to secrete any part of the consecrated offering. These treasures they kept in woods and forests, secured by no other guard than the terrors of their religion; and this steady conquest over human avidity may be regarded as more signal than their prompting men to the most extraordinary and most violent efforts. No idolatrous worship ever attained such an ascendant over mankind as that of the ancient Gauls and Britons; and the Remans, after their conquest, finding it impossible to reconcile those nations to the laws and institutions of their masters, while it maintained its authority, were at last obliged to abolish it by penal statutes; a violence which had never, in any other instance, been practised by those tolerating conquerors."

CHARACTER OF ELIZABETH.

"There are few great personages in history who have been more exposed to the calumny of enemies, and the adulation of friends, than Queen Elizabeth; and yet there is scarce any whose reputation has been more certainly determined by the unanimous consent of posterity. The unusual length of her administration, and the strong features of her character, were able to overcome all prejudices; and, obliging her detractors to abate much of their invectives, and her admirers somewhat of their panegyries, have at last, in spite of political factions, and, what is more, of religious animosities, produced an uniform judgment with regard to her conduct. Her vigour, her constancy, her magnanimity, her penetration and vigilance, are allowed to merit the highest praise, and appear not to have been surpassed by any person who ever filled a throne. A conduct less vigorous, less imperious, more sincere, more indulgent to her people, would have been requisite to form a perfect character. By the force of her mind she controlled all her more active and stronger qualities, and prevented them from running into excess. Her heroism was exempt from all temerity, her frugality from avarice, her friendship from partiality, her active spirit from turbulency and a vain ambition. She guarded not herself with equal care, or equal success, from lesser infirmities; the rivalship of beauty, the desire of admiration, the jealousy of love, and the sallies of anger.

"Her singular talents for government were founded equally on her temper and on her capacity. Endowed with a great command of herself, she obtained an uncontrolled ascendant over her people; and, while she merited all their esteem by her real virtues, she also engaged their affections by her pretended ones. Few sovereigns of England succeeded to the throne in more difficult circumstances; and none ever conducted the government with such uniform success and felicity. Though unacquainted with the practice of toleration (the true secret for managing religious factions), she preserved her people, by her superior prudence, from those confusions in which theological controversy had involved all the neighbouring nations; and though her enemies were the most powerful princes in Europe, the most active, the most enterprising, the least scrupulous, she was able by her vigour to make deep impressions on their state; her own greatness meanwhile remaining untouched and unimpaired.

"The wise ministers and brave warriors who flourished during her reign share the praise of her success; but instead of lessening the applause due to her, they make great addition to it. They owed, all of them, their advancement to her choice; they were supported by her constancy; and, with all their ability, they were never able to acquire any undue ascendant over her. In her family, in her court, in her kingdom, she remained equally mistress. The force of the tender passions was great over her, but the force of her mind was still superior; and the combat, which her victory visibly cost her, serves only to display the firmness of her resolution and the loftiness of her ambitious sentiments.

"The fame of this princess, though it has surmounted the prejudices both of faction and bigotry, yet lies still exposed to another prejudice which is more durable, because more natural, and which, according to the different views in which we survey her, is capable of either exalting beyond measure or diminishing the lustre of her character. This prejudice is founded in consideration of her sex. When we contemplate her as a woman, we are apt to be struck with the highest admiration of her great qualities and extensive capacity; but we are apt also to require some more softness of disposition, some greater lenity of temper, some of those amiable weaknesses by which her sex are distinguished. But the true measure of estimating her merit is, to lay aside all these considerations, and consider her merely as a rational being, placed in authority, and entrusted with the government of mankind. We may find it difficult to reconcile our fancy to her as a wife or a mistress; but her qualities as a sovereign, though with some considerable exceptions, are the object of undisputed applause and approbation."

LESSONS IN ALGEBRA.—No. XXVIII.

(*Continued from page* 185.)

A VARIETY of other formulæ may be deduced from the equations in our last lesson, the investigation of which will afford the student a pleasing and profitable exercise.

By the third formula, e.g., may be found any number of arithmetical means, between two given numbers. For the whole number of terms consists of the *two extremes* and all the *intermediate* terms. If then $m =$ number of means, $m + 2 = n$, the whole number of terms. Substituting $m + 2$ for n in the third equation, we have,

The common difference, $d = \frac{s - a}{m + 1}$, in which a, s and m are given.

Prob 5. Find 6 arithmetical means, between 1 and 43.

Ans. { The common difference is 6,
The series, 1, 7, 13, 19, 25, 31, 37, 43.

It is obvious from the mode in which we obtained an expression for the sum of an arithmetical series, that *the sum of the extremes is equal to the sum of any other two terms equally distant from the extremes.* Thus, in the series 3, 5, 7, 9, 11, the sum of the first and last terms, of the first but one and last but one, etc., is the same in each case, viz. 14. The same is true of every series.

Prob. 6. If the first term of an increasing arithmetical series is 3, the common difference 2, and the number of terms 20, what is the sum of the series?

Prob. 7. If 100 stones are placed in a straight line, at the distance of a yard from each other, how far must a person travel, to bring them one by one to a box placed at the distance of a yard from the first stone?

Prob. 8. What is the sum of 150 terms of the series

$$\frac{1}{3},\ \frac{2}{3},\ 1,\ \frac{4}{3},\ \frac{5}{3},\ 2,\ \frac{7}{3},\ \text{etc.}?$$

Prob. 9. If the sum of an arithmetical series is 1,455, the least term 5, and the number of terms 30, what is the common difference?

Prob. 10. If the sum of an arithmetical series is 567, the first term 7, and the common difference 2, what is the number of terms?

Prob. 11. What is the sum of 32 terms of the series

$$1,\ 1\tfrac{1}{2},\ 2,\ 2\tfrac{1}{2},\ 3,\ \text{etc.}?$$

Prob. 12. A gentleman bought 47 books, and gave 10 shillings for the first, 30 shillings for the second, 50 shillings for the third, etc.: what did he give for the whole?

Prob. 13. A person put into a charity-box a shilling the first day of the year, two shillings the second day, three shillings the third day, etc., to the end of the year: what was the whole sum for 365 days?

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Prob. 14. How many etrokes does a common clock etrike in 24 hours?

Prob. 15. The clocks of Venice go on to 24 o'clock: how meny etrokes do they etrike in e day?

Prob. 16. Required the sum of the odd numbers 1, 3, 5, 7, 9, etc., continued to 101 terme.

Proh. 17. Required the 365th term of the eerice of even numhers 2, 4, 6, 8, 10, 12, etc.?

Prob. 18. The first term of e series is 4, the common difference 3, end the number of the terms 100: whet is the last term?

Prob. 19. A man puts £1 out to interest et 6 per cent.: what will be the amount in 40 yeare et simple interest?

Proh. 20. The extremee of an arithmetical series are 2 and 29, end the number of terme is 10: what is the common difference?

Proh. 21. The extremes of an arithmetical seriee are 3 and 39, end the common difference 2: what is the number of terms?

Prob. 22. Find 5 means between 6 and 48.

Prob. 23. Find 6 meane between 6 and 36.

Prohlems of various kinds, in erithmetical progression, may be solved hy steting the conditions elgehraically, end then reducing the eqnetions. Thus,

Proh. 24. Find four numbers in arithmetical progreseion, whose eum ehall be 56, and the sum of their equares 864.

Let $x =$ the second of the four nnmbers,
And $y =$ their common difference:

The eeries will be $x - y$, x, $x + y$ and $x + 2y$;
By the conditions, $(x - y) + x + (x + y) + (x + 2y) = 56$
And $(x - y)^2 + x^2 + (x + y)^2 + (x + 2y)^2 = 864$
That is, $4x + 2y = 56$
And $4x^2 + 4xy + 6y^2 = 664$

Redncing these equations, we hove $x = 12$, ond $y = 4$.

The numhers required, therefore, are 8, 12, 16 and 20.

Prob. 25. The eum of three numbers in arithmetical progression is 9, and the sum of their cubes is 153: whet are the numbere?

Proh. 26. The sum of three numbers in arithmetical progression is 15, and the sum of the squares of the two extremes is 58: whet are the numbers?

Prob. 27. There are four numbers in arithmetical progression; the sum of the equares of the first two is 34, and the sum of the squares of the last two is 130: whet are the numbers?

Proh. 28. A certain number conaiets of three digits, which ere in arithmetical progression, and the number divided hy the sum of its digits is eqnal to 26; but if 198 be added to it, the digits will be inverted: whet is the numher?

Let the digits be equel to $x - y$, x and $x + y$, respectively. Then the number $= 100(x - y) + 10x + (x + y) = 111x - 99y$, etc.

Prob. 29. The eum of the squaree of the extremes of four numbers in arithmetical progression is 200, and the sum of the squares of the meane is 136: whet are the numbers?

Prob. 30. There are four nnmbere in arithmetical progreseion whose eum is 28, and their continued product is 585: whet are the numbers?

Geometrical Proportion and Progression.

If four quantities are in *geometrical proportion, the product of the extremes is equal to the product of the means.* Thus,

$12 : 6 :: 15 : 10$; therefore $12 \times 10 = 8 \times 15$. Hence,

Any *factor* mey be transferred from one of the means to the other, or from one extreme to the other, without affecting the proportion.

Thue, if $a : mb :: x : y$, then $a : b :: mx : y$; for the prodnct of the means in both cases is the eame.

So, if $na : b :: x : y$, then $a : b :: x : ny$.

On the other hand, if the product of two qnantities is equal to the prodnct of two others, the four qnantities will form e proportion, if they ere so erranged that those on one side of the equation ehall conetitute the means, and those on the other eide the extremes. Thus, since $6 \times 12 = 6 \times 9$, then $6 : 8 :: 9 : 12$.

Cor. The eame must be true of *any factors* which form the two sides of an equation. Thus, if

$(a + b) \times c = (d - m) \times y$, then $a + b : d - m :: y : c$.

If *three* quantities are proportional, the product of the extremes is equel to the *square* of the mean. For this mean proportionel is, et the same time, the consequent of the first couplet, and the antecedent of the last. It is, therefore, to be multiplied *into itself*, that is, it is to be *squared*.

Thus, $4 : 6 :: 6 : 9$; therefore $4 \times 9 = 6 \times 6$.

If $a : b :: b : c$, then multiply extremes end means, $ac = b^2$.

Hence, e *mean proportional* between two quentities may be found by *extracting the square root of their product.*

If $a : x :: x : c$, then $x^2 = ac$, and $x = \sqrt{ac}$.

In e proportion, either extreme is equal to the product of the means, divided by the other extreme; and either of the means is equal to the product of the extremes, divided by ths other mean.

1. If $a : b :: c : d$, then $ad = bc$.*
2. Dividing by d, $a = bc \div d$.
3. Dividing the first by c, $b = ad \div c$,
4. Dividing it hy b, $c = ad \div b$.
5. Dividing it by a, $d = bc \div a$.

Thet is, the *fourth* term is eqnal to the *product of the second and third divided by the first.*

N.B. On this principle is founded the rule of simple proportion in arithmetic, commonly called the "Rule of Three." Three numhers are given to find e fourth, which is obtained hy multiplying together the second and third, and dividing hy the first.

The propositions respecting the products of the meane and of the extremes, furnish e very eimple and convenient criterion for determining whether any four quantities are proportionel. We heve only to multiply the means together, and also the extremee. If the produets are equal, the quantities are proportional. If the products ere not equal, the quentities are not proportional.

It is evident that the terms of e proportion mey undergo any *change* which will not destroy the *equality* of the *ratios*, or which will leave the product of the *means* eqnal to the product of the *extremes*. These changes are *numerous*, but they may be reduced to e few general principles.

Case I. *Changes in the order of the terms.*

If four quentities ere proportional, *the order of the means, or of the extremes, or of the terms of both couplets, may be inverted without destroying the proportion.*

Thus, if $a : b :: c : d$, and $12 : 6 :: 6 : 4$, then,

1. *Inverting the means,** $\left\{\begin{array}{l} a : c :: b : d \\ 12 : 6 :: 6 : 4 \end{array}\right.$ the 1st is to the 3rd as the 2nd to the 4th.
2. *Inverting the extremes,* $\left\{\begin{array}{l} d : b :: c : a \\ 4 : 8 :: 6 : 12 \end{array}\right.$ the 4th is to the 2nd as the 3rd to the 1st.
3. *Inverting the terms of each couplet,*† $\left\{\begin{array}{l} b : a :: d : c \\ 8 : 12 :: 4 : 6 \end{array}\right.$ the 2nd is to the 1st as the 4th to the 3rd.

4. We mey change the *order* of the *two couplets.*

Cor. The order of the *whole proportion* may be inverted.

N.B. If the terms of only *one* of the couplets ere inverted, the proportion becomes *reciprocal* or *inverse.*

If $a : b :: c : d$, then a is to b, reciprocally or inversely, as d to c.

Case II. *Multiplying or dividing by the same quantity.*

If four quantics are proportional, *two analogous or two homologous terms may be multiplied or divided by the same quantity, without destroying the proportion.* Thus,

If $a : b :: c : d$, then, if *analogous* terms are multiplied, or divided, the ratioe will not be altered.

1. $ma : mb :: c : d$.
2. $a : b :: mc : md$.
3. $\frac{a}{m} : \frac{b}{m} :: c : d$.
4. $a : b :: \frac{c}{m} : \frac{d}{m}$.

If *homologous* terms be multiplied or divided, both ratios will be equally increased or diminished.

5. $ma : b :: mc : d$.
6. $a : mb :: c : md$.
7. $\frac{a}{m} : b :: \frac{c}{m} : d$.
8. $a : \frac{b}{m} :: c : \frac{d}{m}$.

* This is called *alternation.* (Euclid 16, 5.)
† This is technically called *inversion.*

Cor All the terms may be multiplied or divided by the same quantity. Thus, $ma : mb :: me : md$, or $\frac{a}{m} : \frac{b}{m} :: \frac{e}{m} : \frac{d}{m}$.

Case III. *Comparing one proportion with another.*

If two ratios are respectively equal to a third, they are equal to each other. (Euclid 11, 5.)

This is nothing more than an application of the axiom, that things which are equal to the same are equal to one another.

1. If $a : b :: m : n$ And $e : d :: m : n$ } then $a : b :: e : d$, or $a : e :: b : d$.
2. If $a : b :: m : n$ And $m : n :: e : d$ } then $a : b :: e : d$, or $a : e :: b : d$.

Cor. If $a : b :: m : n$, $m : n > e : d$ } then $a : b > e : d$. (Euclid 13, 5.)

For if the ratio of $m : n$ is greater than that of $e : d$, it is manifest that the ratio of $a : b$, which is *equal* to that of $m : n$, is also greater than that of $e : d$.

N.B. In these instances, the terms which are alike in the two proportions are the *first* two and the *last* two, and the resulting proportion is uniformly direct. But this arrangement is not essential. The order of the terms may be changed in various ways, without affecting the equality of the ratios.

The proposition to which these instances of equality belong is usually cited by the words, "*ex æquo*," or "*ex æquali.*" (Euclid 22, 5.)

Any number of proportions may be compared in the same manner, if the first two or the last two terms in each preceding proportion are the same with the first two or the last two in the following one.

Thus, if $a : b :: e : d$, And $e : d :: h : l$, And $h : l :: m : n$, And $n : n :: x : y$ } then $a : b :: x : y$.

That is, the first two terms of the first proportion have the same ratio as the last two terms of the last proportion. For it is manifest that the ratio of *all* the couplets is the same.

But if the two means, or the two extremes, in one proportion, be the same with the means, or the extremes, in another, the four remaining terms will be *reciprocally proportional.*

If $a : m :: n : b$ And $e : m :: n : d$ } then $a : e :: \frac{1}{b} : \frac{1}{d}$, or $a : e :: d : b$.

For $ab = mn$ And $ed = mn$ } Therefore $ab = ed$, and $a : e :: d : b$.

In this example, the two means in one proportion are like those in the other. But the principle will be the same, if the *extremes* are alike, or if the extremes in one proportion are like the means in the other.

If $m : a :: b : n$ And $m : e :: d : n$ } then $a : e :: d : b$.
Or if $a : m :: n : b$ And $m : e :: d : a$ } then $a : e :: d : b$.

The proposition in geometry which applies to this case is usually cited by the words, "*ex æquo perturbato.*" (Euc. 23, 5.)

Case IV. *Addition and Subtraction of equal ratios.*

If to or from two analogous or two homologous terms of a proportion, two other quantities having the same ratio be added or subtracted, the proportion will be preserved. (Euclid 2, 5.)

For a ratio is not altered by adding to it, or subtracting from it, the terms of another *equal* ratio.

If $a : b :: e : d$, and $a : b :: m : n$,

Then, by adding to, or subtracting from, a and b, the terms of the equal ratio $m : n$, we have,

$a + m : b + n :: e : d$, and $a - m : b - n :: e : d$.

And by adding and subtracting m and n to and from e and d, we have,

$a : b :: e + m : d + n$, and $a : b :: e - m : d - n$.

Here the addition and subtraction are to and from *analogous* terms. But by alternation these terms will become *homologous*, and we shall have,

$a + m : e :: b + n : d$, and $a - m : e :: b - a : d$.

Cor. 1. This addition may evidently be extended to *any number* of equal ratios. (Euclid 2, 5, cor.)

Thus, if $a : b :: \left\{ \begin{matrix} e : d \\ h : l \\ m : n \\ x : y \end{matrix} \right.$ then $a : b :: e + h + m + x : d + l + n + y$

Cor. 2. If $a : b :: e : d$ And $m : b :: n : d$ } then $a + m : b :: e + n : d$. (Euc. 24, 5.)

For by alternation $a : e :: b : d$ And $m : n :: b : d$ } hence $\left\{ \begin{matrix} a + m : e + a :: b : d, \\ \text{or } a + m : b :: e + a : d. \end{matrix} \right.$

Hence, if two analogous or homologous terms be added to or subtracted from the two others, the proportion will be preserved.

Thus, if $a : b :: e : d$, and $12 : 4 :: 6 : 2$, then,

1. *Adding* the *last* two terms to the *first* two.

$a + e : b + d :: a : b$	$12 + 6 : 4 + 2 :: 12 : 4$	
and $a + e : b + d :: e : d$	$12 + 6 : 4 + 2 :: 6 : 2$	
or $a + e : a :: b + d : b$	$12 + 6 : 12 :: 4 + 2 : 4$	
and $a + e : e :: b + d : d$	$12 + 6 : 6 :: 4 + 2 : 2$.	

2. *Adding* the two *antecedents* to the two *consequents.*

$a + b : b :: e + d : d$	$12 + 4 : 4 :: 6 + 2 : 2$
$a + b : a :: e + d : e$, etc.	$12 + 4 : 12 :: 6 + 2 : 6$, etc.

This is called *composition.* (Euclid 18, 5.)

3. *Subtracting* the *first* two terms from the *last* two.
 $c - a : a :: d - b : b$, or $c - a : e :: d - b : d$, etc.
4. *Subtracting* the *last* two terms from the *first* two.
 $a - e : b - d :: a : b$, or $a - e : b - d :: e : d$, etc.
5. *Subtracting* the *consequents* from the *antecedents.*
 $a - b : b :: e - d : d$, or $a : a - b :: e : e - d$, etc.

The alteration expressed by the last of these forms is called *conversion.*

6. *Subtracting* the *antecedents* from the *consequents.*
 $b - a : a :: d - e : e$, or $b : b - a :: d : d - e$, etc.
7. Adding and subtracting, $a + b : a - b :: e + d : e - d$.

That is, the sum of the first two terms is to their difference as the sum of the last two to their difference.

Cor. If any compound quantities, arranged as in the preceding examples, are proportional, the simple quantities of which they are compounded are proportional also.

Thus, if $a + b : b :: e + d : d$, then $a : b :: e : d$. This is called *division.* (Euclid 17, 5.)

Case V. *Compounding Proportions.*

If the corresponding terms of two or more ranks of proportional quantities be multiplied together, the products will be proportional.

This process is called *compounding proportions.* It is the same as *compounding ratios.* It should be distinguished from what is called *composition*, which is an *addition* of the terms of a ratio.

If	$a : b :: e : d$	$12 : 4 :: 6 : 2$
And	$h : l :: m : n$	$10 : 5 :: 8 : 4$
Then	$ah : bl :: em : dn$.	$120 : 20 :: 48 : 8$.

For, from the nature of proportion, the two ratios in the first rank are equal, and also the ratios in the second rank. And multiplying the corresponding terms is multiplying the *ratios*, that is, multiplying *equals by equals*, so that the ratios will still be equal, and therefore the four products must be proportional.

The same proof is applicable to any number of proportions.

If $\left\{ \begin{matrix} a : b :: e : d \\ h : l :: m : n \\ p : q :: s : y \end{matrix} \right.$ then $ahp : blq :: emx : dny$.

From this it is evident that if the terms of a proportion be multiplied each into *itself*, that is, if they be *raised to any power* they will still be proportional.

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If	$a : b :: c : d$	2 : 4 : 6 : 12
	$a : b :: c : d$	2 : 4 : 6 : 12
Then	$a^2 : b^2 :: c^2 : d^2$.	4 : 16 : : 36 : 144.

Proportionals will also be obtained by *reversing* this process, that is, by extracting the *roots* of the terms.

If $a : b :: c : d$, then $\sqrt{a} : \sqrt{b} :: \sqrt{c} : \sqrt{d}$.

For taking the products of the extremes and means, $ad = bc$.

And extracting the root of both sides, $\sqrt{ad} = \sqrt{bc}$.

That is, $\sqrt{a} : \sqrt{b} :: \sqrt{c} : \sqrt{d}$.

CASE VI. *Involution and Evolution of the terms.*

If several quantities are proportional, *their like powers or like roots are proportional.*

If $a : b :: c : d$,

Then $a^n : b^n :: c^n : d^n$, and $\sqrt[m]{a} : \sqrt[m]{b} :: \sqrt[m]{c} : \sqrt[m]{d}$.

And $\sqrt[m]{a^n} : \sqrt[m]{b^n} :: \sqrt[m]{c^n} : \sqrt[m]{d^n}$, that is, $a^{\frac{n}{m}} : b^{\frac{n}{m}} :: c^{\frac{n}{m}} : d^{\frac{n}{m}}$.

It must not be inferred from this, that quantities have the *same ratio* as their like powers or like roots.

If the terms in one rank of proportionals be *divided* by the corresponding terms in another rank, the quotients will be proportional.

This is sometimes called the *resolution* of ratios.

If	$a : b :: c : d$	12 : 6 :: 18 : 9
And	$k : l :: m : n$	6 : 2 :: 9 : 3
Then	$\frac{a}{k} : \frac{b}{l} :: \frac{c}{m} : \frac{d}{n}$	$\frac{12}{6} : \frac{6}{2} :: \frac{18}{9} : \frac{9}{3}$.

This is merely *reversing* the process in Case V., and may be demonstrated in a similar manner.

N.B. This should be distinguished from what geometricians call *division*, which is a *subtraction* of the terms of a ratio.

When proportions are compounded by multiplication, it will often be the case that the *same factor* will be found in two analogous or two homologous terms.

Thus, If $a : b :: c : d$

And $m : a :: n : s$

$am : ab :: cn : cd$.

Here a is in the first two terms, and c in the last two. Dividing by these, the proportion becomes

$m : b :: n : d$. Hence,

In compounding proportions, *equal factors* or *divisors* in two analogous or homologous terms may be *rejected*.

If	$a : b :: c : d$	12 : 4 :: 9 : 3
	$b : k :: d : l$	4 : 8 :: 3 : 6
	$k : m :: l : n$	8 : 20 :: 6 : 15
Then	$a : m :: c : n$	12 : 20 :: 9 : 15

This rule may be applied to the cases to which the terms "*ex æquo*" and "*ex æquo perturbate*" refer. One of the methods may serve to verify the other.

When four quantities are proportional, if the *first* be greater than the *second*, the *third* will be greater than the *fourth*; if equal, equal; if less, less.

Suppose $a : b :: c : d$, then if $\begin{cases} a = b, & c = d \\ a > b, & c > d \\ a < b, & c < d. \end{cases}$

If four quantities are proportional, their *reciprocals* are proportional, and vice versa.

If $a : b :: c : d$, then $\frac{1}{a} : \frac{1}{b} :: \frac{1}{c} : \frac{1}{d}$.

For in each of these proportions, we have, by reduction, $ad = bc$.

La vertu a cela d'heureux qu'elle se suffit à elle-même, et qu'elle sait se passer d'admirateurs, de partisans et de protecteurs; le manque d'appui et d'approbation, non-seulement ne lui nuit pas, mais il la conserve, l'épure et la rend parfaite: qu'elle soit à la mode, qu'elle n'y soit plus, elle demeure vertu.—*La Bruyère.*

LESSONS IN ITALIAN GRAMMAR.—No. XLII.

Eighth.—Verbs ending in *lere.*

Svéllere, to pluck.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *svéllere*, to pluck	Past: *avére svélto*, to have plucked
Present Gerund: *svellèndo*, plucking	Past Gerund: *avéndo svélto*, having plucked.
Past Participla: *svélto*, plucked	

INDICATIVE MOOD.

Present.

Svéllo or *svélgo*, I pluck
svélli, thou pluckest
svélle, he plucks
svelliámo, we pluck
svelléte, you pluck
svélgono, they pluck

Imperfect.

Svellèva or *svellèa*, I was plucking
svellévi, thou wast plucking
svellèva or *svellèa*, he was plucking
svellevámo, we were plucking
svelleváte, you were plucking
svellévano or *svellèano*, they were plucking

Indeterminata Preterite.

Svélsi, I plucked
svellésti, thou pluckedst
svélse, he plucked
svellémmo, we plucked
svelléste, you plucked
svelsére, they plucked

Future.

Svellerò, I shall or will pluck
svellerái, thou wilt pluck
svellerà, he will pluck
svellerémo, we will pluck
svellerète, you will pluck
svellerànno, they will pluck

Conditional Present.

Svellerèi or *svelleria*, I should or would pluck
svellerésti, thou wouldst pluck
svellerèbbe or *svelleria*, he would pluck
svellerémmo, we would pluck
svelleréste, you would pluck
svellerébbero, *svelleriano*, or *svellerieno*, they would pluck

IMPERATIVE MOOD.

[No First Person.]
Svélli, pluck (thou)
svélla or *svélga*, let him pluck
svelliámo, let us pluck
svellète, pluck (ye or you)
svéllano or *svélgano*, let them pluck

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che svélla or *svélga*, that I may pluck	*Che svellèssi*, that I might pluck
che svélla, svélga, or *svélli*, that thou mayst pluck	*che svellèssi*, that thou mightst pluck
che svélla or *svélga*, that he may pluck	*che svellésse*, that he might pluck
che svelliámo, that we may pluck	*che svellèssimo*, that we might pluck
che svellidte, that you may pluck	*che svellèste*, that you might pluck
che svéllano or *svélgano*, that they may pluck	*che svellèssero*, that they might pluck

So conjugate—

Infinitive.	Present.	Indet. Pret.	Past Part.	English.
Acéllere,	*avéllo*,	*avélsi*,	*avélso* or *-lto*,	to root up
Cólere,	*cólo*,	*cólsi*,	*cólto*,	reverence
Disvéllere,	*disvéllo*,	*disvélsi*,	*disvélto*,	pull out
Espéllere,	*espéllo*,	*espélsi*,	*espélso*,	expel

Ninth.—Verbs ending in *mere.*

Opprimere, to oppress.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *opprimere*, to oppress	Past: *avére oppréso*, to have oppressed
Present Gerund: *opprimèndo*, oppressing	Past Gerund: *avéndo oppréso*, having oppressed
Past Participla: *oppréso*, oppressed	

INDICATIVE MOOD.

Present.

Opprimo, I oppress
opprimi, thou oppressest
opprime, he oppresses
opprimiámo, we oppress
opprimête, you oppress
opprimono, they oppress

Imperfect.

Opprimêva, I was oppressing
opprimêvi, thou wast oppressing
opprimêva, he was oppressing
opprimevámo, we were oppressing
opprimevâte, you were oppressing
opprimévano, they were oppressing

Indeterminate Preterite.

Opprêssi, I oppressed
opprimésti, thou oppressedst
opprêsse, he oppressed
opprimémmo, we oppressed
opprimêste, you oppressed
opprêssero, they oppressed

Future.

Opprimerò, I shall or will oppress
opprimerâi, thou wilt oppress
opprimerà, he will oppress
opprimerémo, we will oppress
opprimeréte, you will oppress
opprimerânno, they will oppress

Conditional Present.

Opprimerêi, I should or would oppress
opprimerésti, thou wouldst oppress
opprimerébbe, he would oppress
opprimerémmo, we would oppress
opprimeréste, you would oppress
opprimerébbero, they would oppress

IMPERATIVE MOOD.

[No First Person.]
Opprimi, oppress (thou)
opprima, let him oppress
opprimiámo, let us oppress
opprimête, oppress (ye or you)
opprimano, let them oppress

SUBJUNCTIVE MOOD.

Present.

Che opprima, that I may oppress
che opprima, that thou mayst oppress
che opprima, that he may oppress
che opprimiámo, that we may oppress
che opprimiâte, that you may oppress
che opprimano, that they may oppress

Imperfect.

Che opprimêssi, that I might oppress
che opprimêssi, that thou mightst oppress
che opprimêsse, that he might oppress
che opprimêssimo, that we might oppress
che opprimêste, that you might oppress
che opprimêssero, that they might oppress

So conjugate—

Infinitive.	Present.	Indet. Pret.	Past Part.	ENGLISH.
Comprimere,	*comprimo*,	*comprêssi*,	*comprêsso*,	to keep under
Esprimere,	*esprimo*,	*esprêssi*,	*esprêsso*,	express
Imprimere,	*imprimo*,	*imprêssi*,	*imprêsso*,	impress
Reprimere,	*reprimo*,	*reprêssi*,	*reprêsso*,	restrain
Assúmere,	*assúmo*,	*assunsi*, *assumésti*, *assúnse*, *assumémmo* *assuméste*, *assúnsero*,	*assúnto*,	take up
Consúmere,	*consúmo*,	*consúnsi*,	*consúnto*,	consume
Presúmere,	*presúmo*,	*presúnsi*,	*presúnto*,	presume
Redímere,	*redímo*,	*redênsi*, *redimésti*, *redênse*, *redimémmo* *redimêste*, *redênsero*,	*redênto*,	redeem

Tenth.—Verbs ending in *pere*.

Rómpere, to break.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *rómpere*, to break	Past: *avêre rótto*, to have broken
Present Gerund: *rompêndo*, breaking	Past Gerund: *avêndo rótto*, having broken
Past Participle: *rótto*, broken	

INDICATIVE MOOD.

Present.

Rómpo, I break
rómpi, thou breakest
rómpe, he breaks
rompiámo, we break
rompête, you break
rómpono, they break

Imperfect.

Rompêva, I was breaking
rompêvi, thou wast breaking
rompeva, he was breaking
rompevámo, we were breaking
rompevâte, you were breaking
rompévano, they were breaking

Indeterminate Preterite.

Rúppi, I broke
rompésti, thou brokest
rúppe, he broke
rompémmo, we broke
rompéste, you broke
rúppero, they broke

Future.

Romperò, I shall or will break
romperâi, thou wilt break
romperà, he will break
romperémo, we will break
romperéte, you will break
romperânno, they will break

Conditional Present.

Romperêi, I should or would break
romperésti, thou wouldst break
romperébbe, he would break
romperémmo, we would break
romperéste, you would break
romperébbero, they would break

IMPERATIVE MOOD.

[No First Person.]
Rómpi, break (thou)
rómpa, let him break
rompiámo, let us break
rompête, break (ye or you)
rómpano, let them break

SUBJUNCTIVA MOOD.

Present.

Che rómpa, that I may break
che rómpa, that thou mayst break
che rómpa, that he may break
che rompiámo, that we may break
che rompiâte, that you may break
che rómpane, that they may break

Imperfect.

Che rompêssi, that I might break
che rompêssi, that thou mightst break
che rompêsse, that he might break
che rompêssimo, that we might break
che rompêste, that you might break
che rompêssero, that they might break

So conjugate—

Corrómpere, to spoil.
Interrómpere, to disturb.
Prorómpere, to rush out.

VOCABULARY.

Quasi, almost, as if
niênte, nothing
però, however
quegli, quei, those
ingannarsi, to be mistaken
assicurâre, to assure
mente, mind; *a mente*, by heart
bastare, to be sufficient
cominciâre, to begin
parlâre, to speak
principiâre, to begin
sempre, always
o, or; *o—o*, whether—or
temêre, to fear
male, badly
errore, a mistake
difficile, difficult
Italiano,—a, Italian
lingua, language
leggiadria, charm, elegance
particularmente, particularly
bocca, the mouth
dama, a lady
sapêre, to know
imparâre, to learn
mese, a month
chiamarsi, to be called or named
maêstro, a master, teacher
conoscere, to know
pezzo, a piece; *un pezzo*, a long while, some time
insegnâre, to teach
spesso, often
ardire, to dare, venture
ardito, bold
tempo, time, weather
fare, to do, make; (with *tempo caldo*, etc.) to be
freddo,—a, cold
caldo,—a, hot
cattivo,—a, bad
pibvere, to rain
vento, the wind
cangiâre, to change
pióggia, rain
diluviâre, to rain pouring
nevicâre, to snow
tuonâre, to thunder
grandinâre, to hail
lampeggiare, to lighten
gelare, to freeze
sta (for *questa*), this
nébbia, a fog
raffreddârsi, to catch cold
quindici, fifteen; *quindici giorni*, a fortnight
giorno, a day
frutto, fruit, effect
stagióne, a season
tardi, late

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colazione, breakfast
presto, quickly, soon
pranzáre, to dine
pranzo, dinner
spasso, pastime, pleasure; *andáre a spasso*, to go for a walk
Francese,—a, French
giráta, a turn; *fare una giráta*, to take a turn
uscire, to go out
per, through, during

Italian-English.

Come va l'Italiáno?* E' dotta V. S. adasso? Non troppo, no so quasi niénte. Si dice però che V. S. parla benissimo. Quegli, che lo dicono, s'ingannano di molto. L'assicúro cha m' è stato detto. Ho potúto dire alcúna paróle che so à mente, a quanto hasta per cominciáro a parláre. Non é 'l tutto di principiáre, bisogna finíre. Parli V. S. sempre o bene, o male. Temo di fare errári. Non tama V. S., la lingua Italiana non è difficile. Lo so, a e' ha molte leggiadrie. E vero, e particularménte nella bona delle dama. O me felice so la sapéssi! Bisogna studiár per imparárla? Quanto tempo è cho V. S. impára?† Non è ancóra un meso. Come si chiáma il suo maéstro?‡ Si chiáma Il Signor T. N. Lo conósco è un pezzo.§ Ha insegnáto a molti amici miéi. Non dice a V. S. che bisógna parláre Italiáno? Signor sì, melo‖ dice spesso. Perche adunque non parla? Con chi vuol V. S. eh' io parli? Con quei cha le parleránno. Vorrèi parlár, mà non ardisco. Non bisógna temére, bisógna éssere ardíto.

Cha tempo fà? Fà bel tempo. Fà cattivo tempo. Fà freddo? Fà caldo. Pióve? Non lo credo. Il vento è cangiáto. Averémo della pióggia.¶ Non pioverà oggi. Dilúvia. Névica? Non tuona mà grándina. Non lampéggia? Fa molto caldo. Ha geláto sta notte? Signor nò ma gela adesso. Mi par che** là una gran nébbia. V. S. non a' ingánna, è vero. V. S. è molto raffreddáta. Sono quíndici giorni cha sono raffreddáto.†† Sono frutti della stagióna. Che ora è? E di buon' ora,‡‡ non è tardi.

E' tempo di far colazióne? Sarà presto tempo di pranzáre. Cha farémo dopi pranzo? Anderemo a spasso. Andiámo à fare una giráta adesso. Non bisógna uscir per questo tempo.§§

English-Italian.

How do you get on with your French? So, so. He knows scarcely anything. It is said they are much advanced (say, are learned), and speak very well. Ha who says so is mistaken. I assure you they make many mistakes. She could say some words that she knew by heart. Do you think the French language is difficult? No, sir, I speak it very well. You can say some words that you know by heart. He can say as much as is sufficient for beginning to speak. The French language has many charms, particularly in the mouth of a lady. How long have I learnt Italian? Not a fortnight yet. She speaks French always, whether well or ill. She is not afraid of making mistakes. I have taught many friends of yours. Have I not told you, you must speak French? Yes, you often tell me so. Has it thundered to-day? Will it freeze to-night? He thinks not. It thunders and lightens now. Yes, and it is very hot. It is dinner time (say, time to dine). They will go out for a walk after breakfast. We will not go out this weather. Is it very cold? I have caught a violent cold.

La vengeance, dit un ancien, est le vice d'un petit génie et d'un âme basse. Elle démasque l'homme et découvre son néant; c'est le triomphe ignominieux de la passion, de la fureur et de l'inhumanité sur la raison, la tranquillité et la bonté d'âme. Celui qui se venge ne peut être victorieux qu'en laissant son honneur et sa réputation sur le champ de bataille.—*Bossuet.*

La ratisfaction que l'on tire de la vengeance ne dure qu'un moment, mais celle qu'on tire de la clémence est éternelle.—*Henry IV.*

* How goes the Italian? *i. e.* How do you get on with your Italian?
† How long have you learnt?
‡ What is your master's name?
§ I have known him a long time.
‖ *For me lo.*
¶ Some rain.
** I think; literally, it seems to me, that.
†† I have had a cold for this fortnight.
‡‡ It is early.
§§ This weather.

LESSONS IN SPANISH.—No. XI.

Conjugation.—*Continued.*

Tenér,* to have.

Infinitive Moon.

Simple Tenses.	*Compound Tenses.*
Present: *tenér*, to have.	Past: *habér tenído*, to have had.
Present Gerund: *teniéndo*, having.	Past Gerund: *habiéndo tenído*, having had.
Past Participle: *tenído*, had.	

Indicative Moon.

Present.	Perfect Indefinite.
Téngo, I have.	*He tenído*, I have had.
Tiénes, thou hast.	*Has tenído*, thou hast had.
Tiéne, he has.	*Ha tenído*, he has had.
Tenémos, we have.	*Hémos tenída*, we have had.
Tenéis, you have.	*Habéis tenído*, you have had.
Tiénen, they have.	*Han tenído*, they have had.
Imperfect.	**First Pluperfect.**
Tenía, I had.	*Había tenído*, I had had.
Tenías, thou hadst.	*Habías tenído*, thou hadst had.
Tenía, he had.	*Había tenído*, he had had.
Teníamos, we had.	*Habíamos tenído*, we had had.
Teníais, you had.	*Habíais tenído*, you had had.
Tenían, they had.	*Habían tenído*, they had had.
Perfect Definite.	**Second Pluperfect.**
Tuve, I had.	*Húbe tenído*, I had had.
Tuviste, thou hadst.	*Hubíste tenído*, thou hadst had.
Tuvo, he had.	*Húbo tenído*, he had had.
Tuvímos, we had.	*Hubímos tenído*, we had had.
Tuvísteis, you had.	*Hubíste tenído*, you had had.
Tuviéron, they had.	*Hubiéron tenído*, they had had
First Future.	**Second Future.**
Tendré, I shall or will have.	*Habré tenído*, I shall or will have had.
Tendrás, thou wilt have.	*Habrás tenído*, thou wilt have had.
Tendrá, he will have.	*Habrá tenído*, he will have had.
Tendrémos, we shall have.	*Habrémos tenído*, we shall have had.
Tendréis, you will have.	*Habréis tenído*, you will have had.
Tendrán, they will have.	*Habrán tenído*, they will have had.

Imperative Mood.

[No First Person.]

Ten, have thou.
Ténga, let him have, or, may he have.
Tengámos, let us have, or, may we have.
Tenéd, have you.
Téngan, let them have, or, may they have.

Subjunctive Mood.

Present.	Perfect Indefinite.
Ténga, I may have.	*Háya tenído*, I may have had.
Téngas, thou mayest have.	*Háyas tenído*, thou mayest have had.
Ténga, he may have.	*Háya tenído*, he may have had.
Tengámos, we may have.	*Hayámos tenído*, we may have had.
Tengáis, you may have.	*Hayáis tenído*, you may have had.
Téngan, they may have.	*Hayan tenído*, they may have had.

* *Tener* is seldom used as an auxiliary verb, and *haber* is seldom used as a transitive verb. Thus, "I *have* money," would be *Tengo dinero*; and, "I *have* spoken," *He hablado.*

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Imperfect.	Pluperfect.
Tuviéra, tendría, or *tuviese*, I would, should, or might have.	*Hubiéra, habría*, or *hubiese tenído*, I would, should, or might have had.
Tuviéras, tendrías, or *tuvieses*, thou wouldst, shouldst, or mightst have.	*Hubieras, habrías*, or *hubieses tenído*, thou wouldst, shouldst, or mightst have had.
Tuviéra, tendría, or *tuviese*, he would, should, or might have.	*Hubiéra, habría*, or *hubiese tenído*, he would, should, or might have had.
Tuviéramos, tendríamos, or *tuviésemos*, we would, should or might have.	*Hubiéramos, habríamos*, or *hubiésemos tenído*, we would, should, or might have had.
Tuviérais, tendríais, or *tuviéseis*, you would, should, or might have.	*Hubiérais, habríais*, or *hubiéseis tenído*, you would, should, or might have had.
Tuviéran, tendrían, or *tuviesen*, they would, should, or might have.	*Hubiéran, habrían*, or *hubiésen tenído*, they would, should, or might have had.
First Future.	**Second Future.**
Si tuviére, if I should have.	*Si hubiére tenído*, if I should have had.
Si tuviéres, if thou shouldst have.	*Si hubiéres tenído*, if thou shouldst have had.
Si tuviére, if he should have.	*Si hubiére tenído*, if he should have had.
Si tuviéremos, if we should have.	*Si hubiéremos tenído*, if we should have had.
Si tuviéreis, if you should have.	*Si hubiéreis tenído*, if you should have had.
Si tuviéren, if they should have.	*Si hubiéren tenído*, if they should have had.

In ordinary conversation, instead of the second person singular and plural, *vmd.* with the third person singular, and *vmds.* with the third person plural of the verb, are used; as,

Vmd. es, you are.	*Vmd. ha tenido*, you have had.
Vmds. son, you are.	*Vmds. han tenido*, you have had.

The pronoun You in English is used in both numbers and both genders without any change: in Spanish, *vmd.* (*usted*) has its plural *vmds.* (*ustedes*), but does not undergo any change to distinguish the gender to which it may be applied. Thus, What do you say, sir? *¿qué dice vmd., señor?* What do you say, madam? *¿qué dice vmd., señora?* What do you say, gentlemen? *¿qué dicen vmds., señores?* What do you say, ladies? *¿qué dicen vmds., señoras?*

The phrases "to be hungry," "to be thirsty," "to be afraid," "to be cold," "to be hot," are rendered in Spanish by the verb *tener* (to have), and the corresponding noun; as "to have hunger," "to have thirst," "to have fear," "to have shame," "to have cold," "to have heat."

Vocabulary.

Manzana, apple.	*Pera*, pear.
Nuez, nut.	*Bota*, boot.
Sopa, soup.	*Aceite*, oil.
Calentura, fever.	*Memória*, memory.
Marmol, marble.	*Hierro*, iron.
Paciéncia, patience.	*Suceso*, success.
Calor, heat.	*Frío*, cold, coldness.
Vergüenza, shame.	*Temor*, fear.
Silla, chair.	*Ayer*, yesterday.
Es estraño, it is strange.	*Con*, with.

Model Sentences.

Esa muger no tiene vergüenza, that woman has not shame (*i. e.* is not ashamed).	*Juan tiene calor*, John has heat (*i. e.* John is hot).
	Tenga Pedro dinero, let Peter have money.

Spanish-English.

¿Tiene vmd. manzanas? Tengo manzanas. Tenemos plumas. Tienen peras. Vms. tienen sillas. Ella tiene hambre. Tengo sed. Tenemos calor. Tienen vergüenza. Tengo temor. Tenemos frío. ¿Tengo yo vergüenza? Tienes vergüenza. Tenéis una lámpara. ¿Quién tiene nueces? ¿Quienes tienen peras? Mis hermanos tienen hierro. Tengo manteca. Tenéis espejos. Tenemos tenedores. Tienes cuchillos. ¿Qué espécie de botones tiene V.? ¿Tenemos marmol? ¿Qué espécie de azucar tiene el aldeano? Ella no tiene marido. Tengo tres hijos y dos hijas. Tenéis tres hermanos. Tenemos una casa. ¿Tenemos médias? ¿Tienes candeleros? Non tengo harina. No tenéis leche. La rosa tiene espinas. Vmd. tiene memória. María tiene mucha confianza en el juez. ¿Tienen vms. sopa? Tenemos suceso. ¿Tenéis paciencia? El médico tenía confianza en la Española. Ella no tenía lámpara. Teníamos hambre. Yo tenía una rosa. Tenían dinero. Vmd. tenía una média. Teníais plata. Vms. tenían confianza en mi hermano. Tenías oro. Ella tenía prudéncia. ¿Tenía yo zapatos? ¿Teníamos botas? ¿No tenían mesas?

Tuvo azúcar ayer. Tuvieron manteca ayer. Tuve botones ayer. Ella tuvo harina ayer. Tuvisteis dinero. Tuvimos lámparas. Tuviste candeleros. No tuvieron espéjos. ¿Tuviste una pluma? Tuva una casa. Tuvimos medias de seda ayer. Tuvo sillas ayer.

El zapatero ha tenido mucho cuidado. Ha tenido mucho hierro. Has tenido tres hijas. Hemos tenido dos hijos. María ha tenido calentura. Ella has tenido dos maridos. Han tenido muchos cuidados. Habéis tenido mucho dinero. Yo no había tenido sopa.

Tendré una candelero. Ella tendrá un tenedor. Tendrán aceite. Vmd. tendrá hambre. Tendrás calor. Tendremos sed. Tendrán vergüenza. Tendréis tomor. Tendré frío. Habré tenido dinero.

Tened paz con todos los hombres. Tan paz con todos los hijos del médico. Tenga plumas. Tengan miel. Tengamos espejos. Tenga vmd. confianza en él.

Quiero que mi madre tenga harina. Es posiblo qne tengas aceite. Probable es qne tengan lámparas. Quiero que María tenga dinero. Quiero qne yo tenga medias de seda. Probable es que tengamos algun mérito. Es posible que tengais hambre. Quiero que vms. tengan candeleros.

No era estraño que tuviesen peras. No era estraño que yo tuviese dinero. No era estraño que vmd. tuviese aceite. Era preciso que no tuviésemos azúcar. Si tuvieses botas, yo tendría zapatos. Juan tendría un tenedor. No creo que Pedro haya tenido manteca. ¡Ojalá yo no hubiera tenido estas lámparas! ¡Ojalá no hubieran tenido esos libros! Si yo tuviere paciéncia, tendré suceso. Si mis hijos tuvieren paciéncia, tendrán suceso.

English-Spanish.

They have pears. Have you (*vmd.*) apples? I have apples. We have pens. They have pears. You (*vms.*) have chairs. She is hungry. I am thirsty. We are hot. They are ashamed. I am afraid. We are cold. I am ashamed. Thou art ashamed. Ye have a lamp. Who has nuts? Who have pears? My brothers have iron. I have butter. Ye have looking-glasses. We have forks. Thou hast knives. What sort of buttons have you (*vmd.*)? Have we marble? What sort of sugar has the villager? She has no husband. I have three sons and two daughters. Ye have three brothers. We have a house. Have we stockings? Hast thou candlesticks? I have no flour. Ye have no milk. The rose has thorns. You (*vmd.*) have a memory. Mary has much confidence in the judge. Have you (*vms.*) soup? We have success. Have ye patience?

The physician had (imperf.) confidence in the Spanish-woman. She had (imperf.) no lamp. We were (imperf.) hungry. You (*vms.*) had (imperf.) confidence in my brother. Had (imperf.) we boots?

He had sugar yesterday. They had butter yesterday. I had buttons yesterday. We had a fever yesterday. Ye had chairs yesterday.

The shoemaker has had much care. I have had much iron. Thou hast had three daughters. We have had two sons. Mary has had a fever. She has had two husbands. They have had many cares. Ye have had much money. I had not had soup.

I shall have a candlestick. She will have a fork. They will have oil. You (*vmd.*) will be hungry. Thou wilt be

hot. We shall-be thirsty. They will be ashamed. Ye will be afraid. I shall be cold. I will have had money.

Have-ye peace with all men. Have-thou peace with all the sons of the physician. Let-him-have pens. Let-them-have honey. Let-us-have looking-glasses. May you (*vmd.*) have confidence in him.

I wish that my mother may-have flour. It-is possible that thou-mayest-have oil. It-is probable that they-may-have lamps. I-wish that Mary may-have money. I-wish that I may-have silk stockings. It-is probable that we-may have some merit. It-is possible that ye-may be hungry. I wish that you (*vmds.*) may-have candlesticks.

It-was (*era*) not strange that they-should-have pears. It-was not strange that I should have money. It-was not strange that you (*vmd.*) should have oil. It was necessary that we should not have sugar. If thou shouldst have boots, I would-have shoes. John would have a fork. I do not believe that Peter has (say, may-have) had butter. O-that I had not had these lamps! O-that they-had not had those books! If I hav (say, shall have) patience, I shall have success. If my sons have (say, shall have) patience, thay will heve suecces.

The student can now write ell the persons of the tenses of the verb *tener*, as he has been already directed with regard to previous verbs.

OF THE CONJUGATIONS OF REGULAR VERBS.

It has been already mentioned that there are in Spanish three conjugations: the first comprehending verbs whose infinite ends in *ar*; the second, those ending in *er*; and the third, those ending in *ir*.

Every verb consists of two parts—the *root* and the *termination*, or the *verb root* and the *verb-ending*. The verb-root consists of those letters which are not changed by inflection; as *am* in *am-ár, am-o, am-ába, am-é, am-aré*. Those letters, which may be changed by inflection, to show the different moods, tenses, persons, and numbers, constitute the verb-endings. Thus, in the preceding examples, the letters *ár, o, ába, é, aré*, are the verb-endings.

The following is a tabular view of the verb-endings of all the conjugations. The figures 1, 2, 3, denote the first, second, and third conjugations respectively:—

Conjug.	Infin. Mood.	Past Part.	Gerund.
1.	-ár	-ádo	-ándo
2.	-ér	-ido	-iéndo
3.	-ir	-ido	-iéndo

INDICATIVE MOOD.

Present.

	Singular.			*Plural.*		
Conj.	1 Per.	2 Per.	3 Per.	1 Per.	2 Per.	3 Per.
1.	-o	-as	-a	-ámos	-áis	-an
2.	-o	-es	-e	-émos	-éis	-en
3.	-o	-es	-e	-imos	-is	-en

Imperfect.

1.	-ába	-ábas	-ába	-ábamos	-ábais	-ában
2.	-ía	-ías	-ía	-íamos	-íais	-ían
3.	-ía	-ías	-ía	-íamos	-íais	-ían

Perfect Definite.

1.	-é	-áste	-ó	-ámos	-asteis	-áron
2.	-í	-iste	-ió	-imos	-isteis	-ieron
3.	-í	-iste	-ió	-imos	-isteis	-ieron

First Future.

1.	-aré	-arás	-ará	-arémos	-aréis	-arán
2.	-eré	-erás	-erá	-erémos	-eréis	-erán
3.	-iré	-irás	-irá	-irémos	-iréis	-irán

IMPERATIVE MOOD.

1.	-e	-a	-o	-émos	-ád	-en
2.	-a	-s	-a	-ámos	-éd	-an
3.	-a	-e	-a	-ámos	-íd	-an

SUBJUNCTIVE MOOD.

Present.

	Singular.			*Plural.*		
Conj.	1 Per.	2 Per.	3 Per.	1 Per.	2 Per.	3 Per.
1.	-e	-es	-a	-émos	-éis	-en
2.	-a	-as	-a	-ámos	-áis	-an
3.	-a	-as	-a	-ámos	-áis	-an

Imperfect.

1.	-ára	-áras	-ára	-áramos	-árais	-áran
	-aría	-arías	-aría	-aríamos	-aríais	-arían
	-ase	-ases	-ase	-asemos	-aseis	-asen
2.	-iéra	-iéras	-iéra	-iéramos	-iérais	-iéran
	-ería	-erías	-ería	-eríamos	-eríais	-erían
	-iese	-ieses	-iese	-iesemos	-ieseis	-iesen
3.	-iéra	-iéras	-iéra	-iéramos	-iérais	-iéran
	-iría	-irías	-iría	-iríamos	-iríais	-irían
	-iese	-ieses	-iese	-iesemos	-ieseis	-iesen

First Future.

1.	-áre	-áres	-áre	-áremos	-áreis	-áren
2.	-iére	-iéres	-iére	-iéremos	-iéreis	-iéren
3.	-iére	-iéres	-iére	-iéremos	-iéreis	-iéren

CHANGES IN THE VERB-ENDING.

A change takes place in the first letter of the verb-ending in the gerund, third person singular and plural of the perfect definite in the indicative, and in all the persons of the first and third forms of the imperfect subjunctive, and in the first fnture of the same mood, in the second or third conjugation, when the verb-root ends in *a, e*, or *u*. This change is merely the substitution of *y* for *i*; as, *ca-ér, ca-yéndo, ca-yó, ca-yéron, ca-yére, ca-yése*, etc.; *cre-ér, cre-yendo, cre-yó, cre-yéron, cre-yére, cre-yéres*, etc.; *argu-ír, argu-yéndo, argu-yó*, etc.

If the last letter of the verb-root be a silent *u*, the change in the verb-ending does not take place; as, *persegu-ír, persiguiéndo*, etc., and not *pesigu-yéndo*.

CHANGES IN THE VERB-ROOT.

In order that the last letter of the verb-root may retain, in all the tenses, the same sound which it has in the infinitive, a change of letters is sometimes required. This change can only take place when the verb-root end in *c, g, gu*, or *qu*.

In such cases, there is changed, in the *first conjugation*,
c of the verb-root into *qu* before *a* of the verb-ending; as, *toc-ár; toqu-é*.
g of the verb-root into *gu* before *a* of the verb-ending; as, *pág-ar; pégu-es*.

In the *second conjugation*,
c of the verb-root into *z* before *a* or *o*; as, *venc-er; vénz-as, vénz-o*.
g into *j* before *a* or *o*; as, *converg-ér; convérj-a, convérj-o*.

In the *third conjugation*,
c of the verb-root into *z* before *a* or *o*; as, *un-cir; únz-as, únz-o*.
g " " *j* " *a* or *o*; as, *ung-ir; únj-a, únj-o*.
gu into *g* before *e* or *o*; as, *consegu-ir; consig-en, consig-o*.
qu into *c* before *a* or *o*; as, *delinqu-ir; delinc-as, delinc-o*.

The reason for these changes will at once be perceived by the student on his referring to what we have said on the "Sound of the Consonants:" thus *c* is sounded like *k* before *a* or *u*, and like *th* before *e* or *i*; while *qu* before *e* or *i* has the sound of *k*. If, then, in conjugating *tocár* (in the present tense of the subjonctive mood, for example), we retain the *c* in the verb-root, the pronunciation would be altered from the sound of *k* to that of *th*; thus, *to-cár*, pronounced *to-kar*, end *to-ce* pronounced *to-thay*. But by changing *c* into *qu*, the hard sound of *c* is retained; thus, *to-que*, pronounced *to-kay*. And so before *o* or *o*, by changing *c, g, gu*, and *qu* of the verb-root of the second and third conjugations into *z, j, g*, and *c* respectively; and *g* of the first conjugation into *gu* before *s* of the verb-ending.

The compound tenses are always formed by the different persons of the verb *haber* and the past participle of the verb to be conjugated.

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The compound tenses are the past infinitive, the gerund of the past, the perfect indefinite, the first pluperfect, the second pluperfect, and second future of the indicative; the perfect indefinite, pluperfect, and second future of the subjunctive. If the student has committed to memory the simple tenses of the verb *haber*, he is able to conjugate the compound tenses of any verb in Spanish.

FRENCH READINGS.—No. XXXIII.

EUDOXIE.

Section III.

C'est juste![1] répliqua Eudoxie, en rougissant pour sa sœur de cette interprétation ; mais, ajouta-t-elle, tu vas[a] donc me laisser seule, chargée d'une si grande responsabilité?[2]

—Ah! répondit Théela, je tomberais bientôt malade d'ennui, et je serais pour toi-même une charge[b] plutôt qu'une aide.[3] Les caractères et les tempéraments varient comme les figures.[4] Tu te plais à cette vie d'abnégation auprès de ce bon vieillard;[5] je t'admire et je voudrais[c] t'imiter; mais je n'en ai ni la force ni le courage..... Une langueur mortelle m'a saisie l'air de la cour me ranimera.

Adieu donc, Théela, reprit Eudoxie, adieu, et sois heureuse![6] Huit jours après, une grande dame vint chercher[d] Théela ;[7] M. Offenheim, qu'Eudoxie avait préparé, embrassa la fugitive en lui demandant de lui écrire souvent. Puis, quand les chevaux partirent au galop, se retournant vers Eudoxie: Ma fille, lui dit-il, vous voilà seule[e] chargée du pauvre vieillard![8] Dieu vous récompensera.

—Il me récompense déjà, répliqua Eudoxie, puisque vous m'appelez votre fille.[9]

Sur ces entrefaites, l'armée français, qui marchait de victoire en victoire, et qui marchait très vite, s'empara[f] de la Saxe,[10] mais à titre d'alliée. Napoléon respecta la couronne du vieux roi ;[11] seulement, le pays fut occupé par nos troupes, précaution utile aux projets de l'Empereur sur l'Autriche et sur la Prusse. Les généraux, les officiers et les soldats furent répartis chez[g] les habitants.[12] Un général de la garde se présenta, lui et sa suite, avec un billet de logement, au château d'Offenheim.[13] Il fallut bien le recevoir, et, encore, le recevoir bien.[14] Le général souffrait d'une blessure récente ;[15] c'était d'ailleurs un homme jeune encore,[16] d'une grande distinction, et aussi doux dans la vie ordinaire qu'il était terrible dans les combats. M. Offenheim l'admit[h] à sa table,[17] et le Français fut témoin des angéliques vertus d'Eudoxie, dont la grâce l'avait d'abord frappé. Au bout d'un mois de séjour, il fit à l'oncle l'aveu d'un sentiment qu'il cachait le mieux possible aux yeux de la nièce,[18] et offrit son nom et sa main.

Le général était dans la plus belle position de fortune et d'ambition,[19] favori de l'Empereur et tenant[i] à une excellente famille d'Alsace....quasi Allemand par conséquent, ce qui touchait beaucoup M. Offenheim. Le vieillard rajeunissait à cette espérance ;[20] l'idée de pouvoir confier, avant de mourir, sa chère Eudoxie à un époux si éminent par sa position, et qui paraissait si digne d'elle par le cœur,[21] répandait sur la figure du vieillard et dans son humeur une teinte de joie inaccoutumée, dont Eudoxie jouissait, sans pouvoir se l'expliquer.

Colloquial Exercise.

1. Que répondit Eudoxie?
2. Qu'ajouta-t-elle?
3. Que lui répondit Théela?
4. Que dit-elle des caractères?
5. Que dit-elle d'une vie d'abnégation?
6. Quelle fut la réponse d'Eudoxie?
7. Qu'arrive-t-il huit jours après?
8. Que dit M. Offenheim après le départ de Théela?
9. Que répondit la jeune fille?
10. Que fit alors l'armée française?
11. Comment Napoléon traita-t-il le vieux roi?
12. Où envoya-t-on les officiers et les soldats?
13. Qui se présenta au château d'Offenheim?
14. L'accueillit-on bien?
15. Le général se portait-il bien?
16. Qui était le général?
17. M. Offenheim le traita-t-il bien?
18. Que se passa-t-il au bout d'un mois?
19. Quelle était la position de l'officier?
20. L'offre plaisait-elle au vieux châtelain?
21. Qu'est-ce qui répandait la joie sur la figure du vieillard?

Notes and References.—*a.* vas, *will*; or literally, *are going*; from *aller*; L. part ii., p. 76.—*b* charge, *burden*.—*c.* from *vouloir*; L. part ii, p. 110.—*d.* vint chercher, *came to take*.—*e.* vous voilà seule, *you are alone*.—*f.* L. S. 92, R. 3.—*g.* repartis chez, *distributed among*.—*h.* from *admettre*; L. part ii., p. 76.—*i.* tenant, *belonging*.

IRON *versus* GOLD.

Austria possesses, at Eisoners, in Styria, the most remarkable mine of iron in the world. The mountain in which it is situated has been worked for more than 1,000 years. It is 2,340 feet high, and nearly five miles in circumference at its base. It is literally a mountain of iron, the greater portion of the mass being ore of the richest quality. There is a tradition of very long standing amongst the miners to the following effect:—When the barbarians from the regions north of the Danube drove the Romans from Styria, the Genius of the Mountains, wishing to do the new inhabitants a favour, said to them, "Will you have Gold for *one* year, Silver for *twenty* years, or Iron for *ever*?" The wise ancestors of the Styrians, who had just begun to learn the true relative value of these metals, by finding that their rude swords were more than a match for all the wealth of the Romans, decided to accept the latter, and thus their descendants have iron of the finest quality to the present time.

ANSWERS TO CORRESPONDENTS.

J. Cuthbertson.—We are sorry to say we cannot comply with your request.

F. W. L. will find information on all Biblical matters in our Biblical Dictionary.

Benj. Brook.—To get the bearings, recourse must be had to a compass.

Book-keeper.—To balance the account, you must put down the odd shillings and pence as discount allowed, or balance, or profit and loss, taking care to insert it in the account kept under either of these heads.

J. W.—The absolute possessive pronouns are used when the substantive is not expressed but understood; as in the phrase, "His brother and *mine*," where *mine* is equivalent to *my brother*. This is very different from the sentence, "This book is mine," which is equivalent to "This is my book." *Mine* in this case is not the absolute possessive, and therefore the article must be omitted before *mio* in Spanish. Similar remarks apply to the other instances mentioned.

X. Y. Z.—You can visit the Museum of the College of Surgeons on producing a card of admission, or an introduction of a member. The British Museum Reading Room is not open to the general public, but tickets are granted to readers—sufficiently recommended—who can show that the privilege will be well employed. The libraries are open to the public, who are permitted to walk through them, but the books are not accessible.

Lennox.—Letters representing the elementary sounds in language certainly constitute the last stage of improvement in the communication of thought by visible signs. These are called the alphabet, from *alpha, beta*, the two first letters in the list in the Greek language. When and where letters took their origin is not known. The Egyptians paid divine honour to the inventor of letters, under the name of Theuth. By the Greeks he was worshipped under the name of Hermes, and was commonly represented by a head alone, without limbs. The head was that of a beautiful youth, having on it a *petasus*, or bonnet, adorned with two wings. He possessed no other part of the human figure but the head, because no other part was deemed requisite to rational communication. This head had wings, in order to represent words, the medium of communication being as described by Homer—*winged words*. Cadmus is said to have been the first who brought letters into Greece. The English alphabet was not invented to express the phonetic elements of the language.

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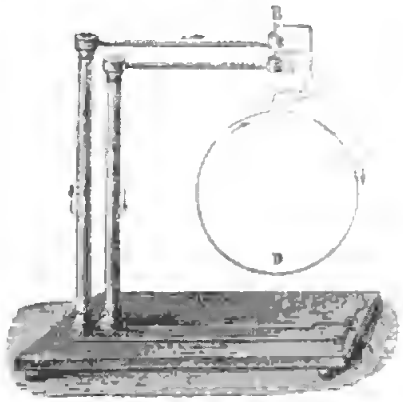
ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LXVII.

(*Continued from page* 215.)

ELECTRO-MAGNETISM.

Directive Action of the Earth upon Electro-dynamical Cylinders.—If we put the suspending electro-dynamical cylinder represented in fig. 448, p. 214, upon the cups A and a of the two columned apparatus in fig. 450, and place it at first out of the

Fig. 450.



magnetic meridian, we shall observe that directly a sufficiently powerful current passes along the electro-dynamical cylinder, the latter begins to move, and stops in such a position that its axis is parallel to the declination needle. Further, in the lower part of the circular currents which compose the cylinder, the current flows from east to west. The directive action of the earth upon electro-dynamical cylinders is therefore the consequence of that which it exerts upon circular currents.

In this experiment, as the electro-dynamical cylinder takes the same direction as a magnetised needle, the extremity pointing to the north is called the south pole, as in magnets, and that which points to the south is called the north pole.

Mutual Action of Magnets and Electro-dynamical Cylinders.—We have already seen that electro-dynamical cylinders exert mutual attraction and repulsion upon each other. The same phenomena take place between magnets and electro-dynamical cylinders. In fact, if you bring one of the poles of a strongly magnetised bar near a moveable electro-dynamical cylinder traversed by a current, there will be attraction or repulsion according as the poles of the magnet and the electro-dynamical cylinder are of a contrary or the same name. Conversely, the same phenomenon is exhibited if you bring an electro-dynamical cylinder traversed by a current and held in the hand, near a moveable magnetised needle. Consequently, the law of attraction and repulsion is applicable to the mutual action of electro-dynamical cylinders and magnets.

Ampère's Theory on Magnetism.—Guided by the analogy which exists between electro-dynamical cylinders and magnets, Ampère propounded an ingenious theory, by means of which magnetic phenomena are brought within the province of electro-dynamics.

Instead of attributing magnetic phenomena to the existence of two fluids, Ampère attributed them to circular voltaic currents around the molecules of magnetic substances.

When these substances are not magnetised, the molecular currents proceed in all directions, and the resultant of their electro-dynamic actions is nothing.

In magnets, on the contrary, the molecular currents being all parallel and in the same direction, their concurring actions have a resultant equivalent to a single current moving circularly on the surface of the magnet, as represented in fig. 451. Hence magnets are merely electro-dynamical cylinders, and magnetic attraction and repulsion nothing but consequences of the action of currents upon currents.

Lastly, in this theory, to explain terrestrial magnetic effects, electric currents are supposed to be incessantly circulating about the globe from east to west, perpendicularly to the magnetic meridian. It is these currents which direct the movements of the needle in the compass, and render iron minerals magnetic. With regard to their nature, it is supposed that

Fig. 451.



they are owing to the variations in the temperature resulting from the successive action of the sun upon different parts of the globe's surface from east to west.

Magnetisation by Currents.—Judging from the influence exerted by currents upon magnets in deflecting the south pole to the left and the north pole to the right, it is natural to conclude that, in acting upon magnetic substances in their natural state, currents must have a tendency to separate the two magnetic fluids. And in fact it is found that, on plunging a wire traversed by a current into iron filings, they are attracted by it as long as the current lasts, but fall away as soon as it ceases, while every other non-magnetic metal exerts no influence on the iron filings.

The action of currents on magnetic substances is especially evident when we wind a copper wire covered with silk round a glass tube, as Ampère did, and put a non-magnetised bar of steel in the tube. It is found that the bar is strongly magnetised if a current be passed through the wire for a very short time.

If, instead of passing a current from the battery along the wire we pass the discharge of a Leyden jar along it, by connecting one of the ends with the external armature and the other with the internal, we shall still find the bar magnetised. We may, therefore, communicate the magnetic property either by voltaic electricity, or the electricity of a machine.

In the above experiment, the wire may be wound upwards from left to right, thus forming what is termed a *right helix*, fig. 452, or downwards from right to left, so as to form what

Fig. 452.



is called a *left helix*, fig. 453. In the right helix the north pole of the bar is always at the extremity at which the current enters; the contrary is the case with the left helix.

Fig. 453.



The nature of the tube round which the wire is wound is not without importance. Wood and glass are productive of no effect; but a thick copper cylinder is capable of completely destroying the effect of the current. It is the same with iron, silver and tin.

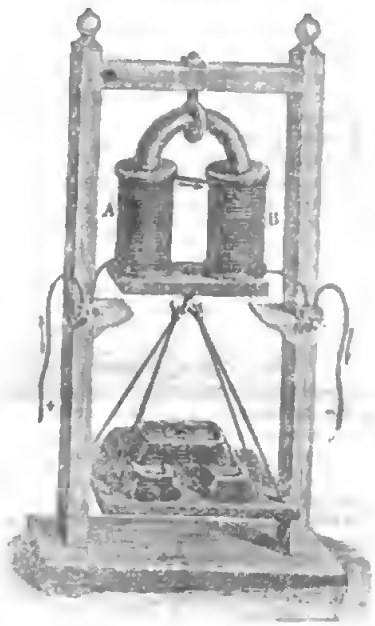
Electro-Magnets are bars of soft iron which are magnetised under the influence of a voltaic current, but only temporarily, because as the coercive influence of soft iron is inappreciable, the two magnetic fluids are neutralised as soon as the current ceases to pass along the wire. If, however, the iron is not perfectly pure, it retains more or less evident traces of magnetisation. Electro-magnets are made in the shape of a horse-shoe, as seen in fig. 454, and a copper wire covered with silk is wound a great many times round the two branches, so as to form two bobbins, A and B. The wire should be wound in the same direction round both branches, that the two ends of the bar may be two poles of contrary name, the south pole being at the entrance of the current and the north pole at its point of departure.

Electro-magnets are very powerful. Their force depends on the size of the iron bar, the strength of the current, and the

length and thickness of the wire. If a soft iron lifter—or *armature*, as it is technically called—be placed at the two ends of the branches of the horse-shoe magnet, it may be made to support very heavy weights, varying according to the size of the electro-magnet.

We shall hereafter speak of the important uses to which the electro-magnet is applied in connection with the electric telegraph, electro-magnetic moving powers, and the properties of powerful magnets. Meanwhile we proceed to give some account of the discoveries and experiments which have been made with reference to electro-magnets.

Fig. 454.



The important discovery of magnetic induction by electrical currents was made by M. Arago, who was led to it by observing that iron filings are attracted by the conducting wire of a galvanic battery. That this property is magnetic, and not simply electrical, was shown by the fact that the filings of other metals are not similarly attracted, and also by permanently magnetising steel needles enveloped in the spirals of electro-dynamical cylinders. And that the phenomenon is one of induction, was proved by the fact that the filings and needles acquire magnetic properties without contact with, and even at a distance from, the conducting wire.

Nearly at the same time that M. Arago was engaged in making these beautiful and valuable experiments in France, Sir H. Davy was occupied with similar investigations in England; which resulted in the independent discovery of the same facts by each of those distinguished philosophers.

Mr. Sturgeon substituted for the steel needles used by Arago and Davy, pieces of soft iron wire wrapped in spirals of copper, and found that they were rendered intensely magnetic.

Our knowledge of electro magnetic induction was next extended by the researches of Professor Henry, an American philosopher, who found that the principle of the galvanic multiplier may be applied to the development of great magnetic power in soft iron, by a small galvanic battery; and employed it for the purpose of studying the inductive action of electrical currents upon considerable masses of iron, and of investigating the relative power of currents of different quantity and intensity, as well as of the same current when transmitted through insulated conducting helixes of various lengths, and opposing different degrees of resistance to its motion.

The apparatus employed by Professor Henry somewhat resembled that represented in fig. 454. It consisted of a bar of iron 2 inches square and 20 inches long, bent in the form of the letter U, or of a horse-shoe, 9½ inches high, and weighing 21 lbs. avoirdupois. A piece of iron from the same bar weighing 7 lbs. was filed flat on one surface for an armature or lifter; and the extremities of the legs of the horse-shoe were truly ground to the surface of the armature.

Round the horse-shoe 540 feet of copper wire, well covered with waxed thread to secure insulation, were wound in 9 coils of 60 feet each. These coils were not wrapped continuously round the whole length of the bar, but each strand occupied about two inches, and was wound several times backwards and forwards over itself; and the several ends of the wire were left projecting, and numbered, so that the first and last of each strand could be readily distinguished.

In this manner a large experimental magnet was formed, with which several combinations of wire could be made by merely uniting the different projecting ends. Thus, if the last end of the first wire be soldered to the first end of the second, and so on through all the series, the whole will constitute a continuous coil of one long wire; and by soldering different ends, a double coil of half the length, or a triple coil of one-third the length, etc., might be easily formed. The horse-shoe was suspended in a strong wooden frame, and an iron bar was fixed below, so as to act as a lever of the second order, graduated and counterpoised, so that the weights supported might be estimated by a sliding weight, as in the common steel-yard.

With a single battery (*i. e.* a battery with one couple), consisting of two concentric copper cylinders and one of zinc between them, excited by immersion in a cup of diluted acid, and exposing a zinc surface of two-fifths of a square foot, the following results were obtained:—

No. of wires soldered to the battery.	Weights supported in lbs. avoirdupois.
1. Each wire in succession	7
2. One on each side of the arch	145
2. One from the end of each leg	200
3. One from each leg, and the other from the arch	300
4. Two from each extremity	507
6. Three on each side	570
9. All the wires attached	650
9. All the wires soldered to a battery exposing one square foot of zinc surface	750
9. All the wires attached to a pair of plates exactly one inch square	85

From the above experiments, it is evident that a very small simple battery with one couple is capable of producing great magnetic effects, if the spirals of the inducing electro-chemical cylinder are numerous, and the resistance to the passage of the current is not very great.

The effect of varying the length of the conducting wires and the intensity of the current, was satisfactorily shown by the following experiments. Six wires, each thirty feet long, attached to the small cylindrical battery described above, caused the horse-shoe bar to lift 375 lbs.; and when the same wires were united so as to form three coils of sixty feet, it supported 290 lbs. Hence it appears, that, with a simple galvanic battery, six short wires are more powerful than three of double the length.

The two wires which had sustained 200 lbs. when separated, being united so as to form a single coil of 120 feet, lifted only 60 lbs. But when a small compound battery of two elements, exposing exactly the same zinc surface as the single battery used in the last experiment, was substituted for it, the weight lifted was 110 lbs., or nearly double.

Also a small horse-shoe, one-quarter of an inch in diameter, wound with eight feet of copper wire, when attached directly to a simple battery with a zinc plate four inches by seven, surrounded with copper, lifted 4½ lbs.; but when the current passed through a copper wire 1,000 feet long and ·045 of an inch in diameter, it supported only half an ounce; through 550 feet, or half the same length of wire, it lifted two ounces. The whole length of the wire being then attached to a small compound battery (*i.e.* a battery with several couples) containing 25 double plates, and presenting exactly the same extent of zinc surface to the action of the acid as the simple battery used in the last experiments, the weight lifted was eight ounces;

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end when the intervening wire was removed and the trough attached directly to the ends of the wire round the horse-shoe, it lifted only seven ounces.

Hence Professor Henry concluded, "that the magnetic action of a compound battery is at least not diminished by passing through a long wire," a fact "directly applicable to Mr. Barlow's project of forming an electro-magnetic telegraph;" which has since been so successfully accomplished by Professor Wheatstone in England, and Professor Morse in America, by means of electro-magnets combined with simple and ingenious mechanical arrangements.

From these experiments Professor Henry also inferred, that "we may either use one long wire or several shorter ones, as the circumstances of the case may require; in the first case, our galvanic combination must consist of a number of plates, so as to give projectile force; in the second, it must be formed of a single pair."

The effect of increasing the quantity of the battery current is in part shown by some of the above-mentioned experiments in the table, from which it appears that 85, 650, and 760 lbs. are the weights supported by the same horse-shoe, when similarly attached to batteries exposing zinc surfaces of two square inches, two-fifths of a square foot, and one square foot respectively. But when the size of the battery was still further increased, no greater effect was produced; and indeed a calorimeter containing twenty-eight plates of copper and zinc, each eight inches square, did not lift so much as the smaller battery; so that 730 lbs. was apparently the maximum magnetic power which could be developed in the horse-shoe.

A series of experiments was separately instituted by Dr. Ten Eyck, to produce a maximum development of magnetism in a small quantity of soft iron. He succeeded in causing a horse-shoe of round iron slightly flattened, one inch long and ·06 of an inch in diameter, weighing six grains, and wound with three feet of brass wire, to lift 5 oz. 5 dwt. 4 grs., or 420 times its own weight. The strongest magnet described appears to be one which was worn in a ring by Sir Isaac Newton, which lifted nearly 250 times its own weight. Hence a much more intense degree of magnetism can be developed in soft iron by an electrical current than in steel by the usual methods of making magnets.

A number of experiments were also tried by Professor Henry, to determine the best form of the iron for receiving magnetism; but not with very satisfactory results. A hollow iron cylinder, which had formed part of a gun barrel, was found to be capable of receiving more magnetism than the same quantity of metal in a solid cylinder of less diameter, but not as much as a solid bar of the same dimensions; and this fact led him to conclude that "magnetic power resides wholly on the surface of iron bodies, but that a certain thickness of metal is necessary for its complete development."

LESSONS IN MORAL SCIENCE—No. XI.

THE PHENOMENA OF THE UNIVERSE.

Let us now suppose that a Great Intelligent First Cause exists, and has existed from eternity; are not all the appearances of the universe correspondent with the existence of such a being?

Again we may demand of an atheist what other evidences of the existence of God he would require? Let him suggest something, which, in the form of evidence, would be more satisfactory to him, and he will not find it easy to fix on any evidence which is stronger or more suitable than what we already possess.

It may appear strange to some that we challenge the atheist to demand any clearer or stronger evidence of the existence of a Supreme Being than that which is already before us. But let the attempt be made to conceive of some evidence of this truth which would be more satisfactory, and better adapted to be a standing proof to all nations, and we have mistaken the matter, if the result will not be, that the existing evidence is as good as any which they could ask. It will be worth while to spend a little time in considering this point; for if we cannot satisfy the atheist of the truth of our position, the discussion may be satisfactory to others who have not been accustomed to view the subject in this light.

It is true we do not see God, and the reason is, he is a spirit; and a spirit, from the very nature of the case, is invisible. We cannot see the souls of our nearest friends; we know that they exist, not by any direct perception of the intelligent substance, but by the actions which they perform through the instrumentality of the body. If God were not a spirit he could not be an active, intelligent, powerful, and perfect being; but being a spirit he must be invisible. Nothing is visible but material substances, and these only by means of light reflected from them to the eye.

It is not forgotten that most atheists, being materialists, deny that there is any such substance as spirit; but they do not and cannot deny, that there is something within us which thinks and feels and wills, and has power to originate bodily motion. Call the substance, of which thought is a property, by what name you please, still it is an invisible substance. Who can pretend to see a thought or a volition? or who would say that he can see the mind, and describe its shape and give its magnitude and dimensions? Let it be supposed, then, that the cause of all intelligence has a nature resembling this intelligent nature of which we are every moment conscious, but far more excellent, as it must be supposed that every excellence exists in a higher degree in the cause than in the effect.

Now supposing such an intelligent being to exist, call him spiritual or material, only let him be a being of thought, will, and passion; and that he is necessarily from his nature invisible to eyes of flesh; the question is, how could such a being make himself known to rational minds such as ours? As we cannot by any direct perception look into the mind of another, and as such a being cannot make himself visible without assuming a gross body, we can conceive of no way by which he can make himself known but by performing some act, or exhibiting to us some work which shall contain the impress of his character. For if he should assume a bodily shape, and thus make himself visible, it would not be the intelligent substance which we perceived, but a body, which was no part of his essence. If an intelligent creature could be so situated in the universe as to have no opportunity of contemplating any work of God, such a creature could never arrive at the knowledge of his existence. But the supposition is impossible; for an intelligent creature could not exist without the consciousness of its own thoughts; and in the mind itself, even if it were cut off from all perception of material things, there is sufficient proof of an efficient, intelligent cause. The impress of the divine attributes is as clearly printed on the soul as on any of the works of God to which man has access.

As the First Cause, if there is one, must be from his nature invisible, the only way by which he can be conceived to make known his existence, is by acting before us some work, in which his wisdom, power and goodness may be manifested; and by the contemplation of which a rational mind may infer that a being does exist to whom these properties belong. If, then, in the various objects in the world, there is as much evidence of these attributes as we can conceive, and in fact far exceeding our most enlarged conceptions, we have the best proof of the existence of a Great First Cause which we could have. The simple question then is, could there be exhibited stronger evidences of wisdom than we have in the structure of the body of man, and in the constitution of his mind? Could the various species of animals in the earth, air and sea, be formed with more consummate wisdom than they are, in relation to the climate in which they live, and the provision made internally and externally for their subsistence, and the propagation of their kind. Examine also the vegetable world. Call in the aid of glasses to inspect the concealed structure of the vessels; contemplate the leaf, the flower, and the mature fruit, and say whether you can conceive of contrivances more exquisite. If any man thinks that animal and vegetable bodies could have been constructed with more wisdom, let him point out in what respects these works of nature are deficient in wisdom. But even if it were possible to conceive of more perfect works, this could not in the least invalidate the argument from them for the existence of an intelligent cause. I. the question were of the degree of perfection in the wisdom exhibited, then the skill manifested in each work would be a proper subject for consideration. An imperfect time-piece

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proves the existence of an artist as fully as one that is perfect.

But there is here no need of this remark, for the atheist may be defied to conceive of any improvement in any of the works of God, in regard to the adaptation of the means used to the end to be accomplished; and these evidences of the wisdom of God are scattered profusely over the whole universe. We cannot turn our eyes to the heaven or the earth, to objects of great magnitude, or so small that they can be seen only by the microscope, but the same admirable perfection of contrivance is manifest in them all. The internal structure of the gnat is as wonderful as that of the elephant; and in the manifestation of wisdom in the creation there is a wonderful variety. No two species are exactly alike; and the difference is exactly such as it should be to accomplish the especial end in view. The more intricate our examination of the contrivance and evident design in the organisation of animal and vegetable bodies, the stronger will be our conviction, and the greater our admiration.

The only question then is, could the evidences of intelligence in the cause, if thus innumerable, be exhibited in a clearer and stronger light than they are; if not, then God could not make known his existence as an intelligent being more clearly than he has done. The number of instances in which design appears is far greater than can be examined, and the degree of wisdom in the various contrivances in organised bodies transcends our conception; how, therefore, could we have by new works greater evidence of an intelligent cause than we already possess?

But there seems in most minds a lurking suspicion, that the existing evidence is not as convincing as it might have been. Even if this were so, we have no right to complain, when it cannot be denied that we have very strong evidence. God is not obliged to give to his creatures the strongest possible evidence of his own existence. He may choose to leave scope for human industry, and also make the reception of the truth a part of our moral probation; and the pleasure of discovering truth after laborious research, a part of the reward of virtue. No doubt this is the fact in regard to some truths of no small importance. The honest inquirer discovers them, while the proud and prejudiced mind, though more acute, misses them, and embraces in their stead dangerous error. In maintaining, therefore, that the evidence for the being of God is as convincing as it could be to an impartial, rational mind, it is not because such clearness is considered essential, but simply because the fact appears to be as stated.

But since many may still suppose that they can imagine much stronger proof than any which exists, let us consider what can be alleged in favour of this opinion.

Could not God speak to us in a voice of thunder, and thus make himself known? Undoubtedly he could, and such a voice would doubtless greatly terrify us; but would it be a stronger proof of his wisdom and power than the works of nature which we behold? If this tremendous sound were heard very often, it would at length become familiar, and would cease to produce the same impression as at first. If heard but seldom, it would leave a suspicion that it might have been no more than a disordered imagination. But how could we be sure that the voice proceeded from a being who would not deceive? The mere hearing the noise could give us no certain evidence of the character and veracity of the speaker?

But perhaps it may be thought that a glorious visible appearance would place the matter beyond all possibility of doubt. The majestic appearance of a divine person would, it may be alleged, satisfy every one. The same objections may be made to this species of evidence as to the former; how could we know that this visible appearance was that of the Great First Cause? Unnatural appearances prove nothing respecting the character of the person who assumes them. If such apparitions were only occasionally exhibited, we should be prone to doubt of their reality; and if frequently, we should become too much accustomed to them to receive any impression. But whatever impression such appearances might make, considered as evidence of an all-perfect Deity, they would not be comparable to that which we have in the works of nature.

But if the Supreme Being exists, why could he not make himself known by working stupendous miracles? Of course, if miracles might be demanded by one, all have the same need; and the same claims and miracles would become so common, that it would be difficult to distinguish them from natural events. And again, miracles require no more power to produce them than is required to produce common events. In many cases they would require no more than a cessation of the power by which natural events are produced. The standing still of the sun, or the stopping of the rotation of the earth, would be nothing else than removing the impulse by which they were originally put in motion.

In a miracle, we only see the effect of divine power. We may infer from this, that there is a Being who can change the laws of nature; and a miracle taken by itself can prove nothing more. But in the works of nature, we have innumerable proofs of the wisdom and beneficence of the Author of the Universe. And the number, variety, and wisdom of these works are evident to every person of common sense. The proofs of a great intelligent cause are spread out over the heavens and the earth, the sea and the air. We are little affected by these objects, because they have ever been before our eyes since our earliest infancy. But as evidences of a Divine existence, their force is not diminished by the uniformity of the laws of nature, by which they are continually produced, but greatly increased. The different species of animals and vegetables have successively been reproduced, according to laws that never vary; and this shows that the plan of the Almighty is perfect, and that He can accomplish all his pleasure, and has given uniform laws to every kind of being which his wisdom and power have produced.

It is not denied that miraculous displays are a decisive proof of a Great First Cause, who is possessed of omnipotence; but what we maintain is, that the evidence of omnipotence is not greater than in the natural effects which are constantly produced before our eyes. And as to the character and attributes of God, they are far more clearly exhibited in the various productions of nature, than they would be by a miraculous interposition. If another sun were placed in the heavens, which is as great a miracle as we can imagine, it would be a proof of mighty power, but not a stronger proof than the existence of the natural sun; and as to the wisdom and goodness of the Deity, there would be no comparison, for in the former case nothing but the existence of Omnipotence could be inferred from the miracle, for there would be no appearance of wisdom in such a miracle. But in the existence of the natural sun, which gives light, heat, motion, and life to all earthly living things, the wisdom and goodness of the Creator are most illustriously displayed. Who can enumerate the benefits which are derived from the influence of the sun? and the same sun, which communicates so many blessings to our world, dispenses blessings in the same way to other planets.

If we saw the dead raised in a thousand instances, it would be a decisive evidence of the existence of a Being of almighty power; but the evidence is fully as strong from the formation and vivification of innumerable animal bodies of many species. And no miracle can be conceived which would furnish stronger evidence of the Divine existence, than the works of creation which are ever before our eyes and our minds. We think, after what has been said, that we cannot wish for more convincing evidence of the existence of a Supreme Being than we already possess in the works of nature spread out before us; and even if we were shut up in a dark dungeon, we have this convincing evidence in our own persons, in the constitution of both our souls and bodies.

The only thing which can be alleged further is, that this might have been made a self-evident truth as much as our own existence, or the existence of the world without us; and many formerly entertained the opinion that the idea of God is innate, and that a speculative atheist is a thing impossible. Some very learned and respectable philosophers and theologians have expressly inculcated this opinion in their writings. Now, although we do not believe there are any innate ideas, and although the existence of God can scarcely be said to be self-evident, yet in the proof of it there is but a single step of reasoning. It is a self-evident truth that every effect must have an adequate cause; and when there is evident design in the effect, the cause must be intelligent. The conclusion is so easily drawn from an intuitive truth, that it is not wonderful that it should be classed among self-evident truths. We can scarcely conceive of the state of that mind which,

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after seriously contemplating the wonderful evidences of design in the human frame, can doubt the existence of an intelligent First Cause, and an intelligent cause producing effects by a wise adaptation of means to a definite end; and the harmonious operation of thousands of parts in the vital functions must, according to every proper definition of the term, be a person.

All the arguments by which the being of God is proved, involve the proof of some of his attributes. If the marks of design in creatures prove the existence of a Creator, it is by showing that he must be possessed of wisdom to cause so many wonderful contrivances as we behold in the world. As the operation of any cause is the exertion of power, so the creation of the world is the action of omnipotence. A greater power than that which brings something out of nothing cannot be conceived; this indeed we cannot comprehend, and, therefore, some who admit that the world is the work of God, as far as relates to the organisation and moulding of matter, yet cannot be persuaded that omnipotence itself can give existence where there was none before. But if God did not create the matter that is in the world, whence did it come? There are but two suppositions; one is, that matter existed from eternity, and is, therefore, self-existent and independent; the other, that it is an emanation of the divine essence. The first is inadmissible; it supposes two eternal beings independent of each other, and the latter leads to pantheism, or that all things are a part of God; as whatever emanates from him must be a part of his essence, for this is immutably the same. Though wisdom and power are the attributes which are first observed, they are not the only attributes of which we may learn something by studying the works of nature. For when we attentively consider the nature of the end, to accomplish which the innumerable contrivances are adapted, we cannot but observe that this end is beneficent. All the parts of animals are connected with the vitality, enjoyment and preservation of the animal or species. The goodness of God is, therefore, as manifest in the creation, as his wisdom. There is not a part in any animal body which can be shown to be without its use. Every species is fitted by the bodily structure, and by the instincts and passions with which it is endued, to enjoy in the most perfect degree that kind of life to which it is destined. Even the minutest animalcules have bodies organised with as exquisite skill as those of the larger species. No living creature exists for which food is not provided, suited to the appetite and nourishment of the species, and which it has the means of procuring. So every species is endowed with the instinctive ability to provide for itself and its progeny suitable places of residence; and there are insects which, though they undergo a remarkable metamorphosis and change of appetites, are still able by their instinct to find the nourishment which is agreeable and necessary. And what is still more wonderful and indicative of far-seeing wisdom in the Creator is the fact, that these insects which were once in the chrysalis state, and afterwards assume the form and instincts of butterflies, are led by an invariable propensity to deposit their eggs on plants necessary for the young grubs, but on which they themselves never feed. Were it not for this wise provision for the young, they would all perish. Between the animal and vegetable world there is a beautiful harmony; the latter to a large extent supplies food for the former. It may be thought that the constitution of things by which one animal preys upon another, is an argument against the goodness of God; but these animals are only intended for a transitory existence, and as they must all die, and are tormented with no apprehensions in regard to the future, and the pain is indeed momentary, if they enjoy much more pleasure than pain during their existence, there seems to be no solid objection against this law of nature.

It has often been alleged as an atheistical objection against the goodness and, by consequence, against the existence of God, that pain or misery has a place among his works. This perhaps is the most plausible of all objections which infidels have ever produced; and yet it has no certain principles on which to rest. With a system such as at the present, where there is a gradation of sensitive beings, it is impossible for us to conceive how all pain could be excluded. As far as we can see, the susceptibility of pleasure carries with it a liability to some degree of pain. What if the pain which animals endure, arise out of the principle of self-preservation, and from the appetites, in the gratification of which consists their enjoyment? Without desire and appetite there could be no animal enjoyment, and when the safety of the animal requires it, it is wisely ordered that by uneasiness or pain it should be stimulated to seek its necessary food, or flee from danger.

And as to man, while in the present world, we cannot conceive how he could have any enjoyment, unless he was also subject to such feelings of uneasiness as rendered him capable of relishing his enjoyments. This remark relates to pains which cannot be avoided, such as the pain of hunger and thirst, and the pain arising from contact with some injurious body. The surface of man's body is the chief seat of pain, because danger commonly approaches him from without. It does not appear, therefore, possible that such a system of creatures as exist in the world could be constituted so as to be exempt from all uneasy feelings. To make creatures whose constitutions would exempt them from all liability to pain, would, as far as we can see, exempt them from all susceptibility to pleasure. And as to those evils which men bring upon themselves by imprudence, intemperance, injustice, or by disobeying the voice of conscience within them, they must be attributed to themselves and not to the constitution of the world. And as God is not obliged to make every creature as great and as happy as it could be made, it may seem to exhibit his wisdom and power to produce beings in whose existence there is a mixture of natural good and evil.

It appears clear, then, that the Author of this universe is powerful, wise, and beneficent; but how does it appear that he is possessed of a moral character? that he loves moral excellence, and disapproves of moral evil? This appears evidently from the moral constitution of man. The law interwoven in his constitution proves that his Maker approves of moral excellence. Again, it would be absurd to suppose that the creature could possess an excellence, and one superior to all natural endowments, of which there was no prototype in the Great First Cause. We may lay it down as a maxim, that whatever perfection we can conceive of must exist in the most perfect degree in the Creator, for all our ideas of perfection are derived from the contemplation of creation; and whatever excellence there is in the creation must exist in the Creator.

Besides, by the laws of nature, virtuous conduct is generally productive of pleasure and peace of mind, and immoral conduct is generally a source of misery. These laws of nature are the laws of God, and manifest his approbation of virtue and disapprobation of vice.

BIOGRAPHY.—No. XVIII.

SAMUEL JOHNSON.

By J. R. Beard, D.D.

Dr. Johnson is the ideal of the schoolmaster and the man of letters as they lived, taught, flogged and ruled in the last century. What a crowd of ideas and usages does the very name of Dr. Johnson bring up in the mind, all of which bear the impress of departed things! Though most of them now find favour as little as they find counterparts, yet are they in some way venerable, even as the manes of the dead and the images of the departed. There is an embalment of literature which, like the ancient Egyptian embalment, hallows as well as preserves the memory of the dead; and so men like Johnson, who if living now would be almost intolerable, have around their shades a halo of subdued and almost sacred grandeur, before which it does a student good to bend the knee of reverence. In making these remarks, we have borne in mind that Johnson, besides being a scholar and an able man, was superstitious, dogmatical, imperious and waspish. A ponderous man was the old Litchfield schoolmaster turned *literateur*. Ponderosity characterises him in every way. A weighty style truly, and rumbling too like other weighty things. A sledge-hammer was the instrument with which he struck blows on the heads of dullards and the hearts of knaves. What a heavy affair is that huge English Dictionary—the work of one man,—truly a "Magnum Opus" in regard both to the process and the result

of the labour. The very person of Johnson gives one the idea of weight. His movements, too, were elephantine. A great man was Johnson; great in body, great in labour, great in intellect, great in learning, great in thought, grandiose in style—in every way great except in heart; and yet not little was he in that faculty, only less in sentiment and in sympathy than in other respects. Certainly his influence was great, and great does his name still remain after the lapse of a century. Yet, though unquestionably great, Dr. Johnson is little read. This comparative neglect is attributable to two things: first, the lack of sentiment before referred to; and secondly, the artificiality of his style. The lack of sentiment produced a certain unnaturalness. In his writings the scholar speaks more than the man, and the schoolmaster nearly as much as either. Hence those Latinised, elaborate, antithetical, and nicely balanced sentences, that court dress, that man-millinery of style, which makes the worst of his compositions almost as intolerable as the best of those of his imitator and fellow pedagogue, Dr. Parr. It is a happy thing for English literature that these ponderous big-wigs of the last age, and the last but one, have given place to men who, if they possess less learning, have far more heart, and make simplicity the mother of literary virtues.

Samuel Johnson, born at Litchfield on the 18th of September, 1709, gained at school in that city and at Stourbridge a varied acquaintance with classical literature. When nineteen years of age he went to Oxford in the capacity of a tutor. At the end of two years his pupil left the university, and for want of means Johnson was compelled to do the same, though he had given proof of talent by turning Pope's "Messiah" into Latin hexameters. After the death of his father (1731), being wholly without resources, he descended to the drudgery of an usher in a school at Market Bosworth. Hurrying from so ungrateful a post, he went to Birmingham, where, among other petty fees, he gained five guineas by translating Lobo's "Travels to Abyssinia." At length he tried to mend his condition by the desperate step of marrying a widow no longer in the bloom of life. With the aid of her fortune, which amounted to £800, Johnson opened a boarding-school near Litchfield. The enterprise proved a failure. Johnson, in company with one of his pupils, the celebrated David Garrick, went to seek his fortune in London, where by a series of publications he raised himself to such fame and authority as made him the czar of literature. Like other distinguished men, Johnson was fain to write for bread, and consequently to write in quarters where bread was to be had. The "Gentleman's Magazine" was his workshop. Among other contributions, his reports of the proceedings in the Houses of Parliament, under the title of "The Transactions of the Senate of Lilliput," set forth in a good old-fashioned Tory dress, may yet be read with pleasure and instruction. His "London" (1738), a poem in imitation of Juvenal's third satire, was followed by his painfully interesting "Life of Richard Savage" (1744), which bore witness to his powers of observation and the force of his pen in prose. Less acceptable were his "Miscellaneous Observations on the tragedy of Macbeth" (1745). Two years after appeared the plan of that work, his "Dictionary of the English Language," which has proved the pillar of his reputation, and which produced a new epoch in lexicography in Great Britian. During the seven years that he laboured on this gigantic undertaking (2 vols. London, 1755), he published "The Vanity of Human Wishes," in imitation of Juvenal's tenth satire, and began the series of essays entitled "The Rambler" (1750-52), most of which he composed himself. That periodical was followed by an inferior work of the same kind, called "The Idler" (1758-60). In 1759 he put forth his widely-circulated political romance, the "History of Rasselas, Prince of Abyssinia," written in a very short time in order to obtain wherewith to pay the cost of his mother's interment. Not until the year 1765 did his long-promised edition of Shakespeare make its appearance, which added little to his distinction, as it failed to show a deep insight into his author's spirit, and an exact acquaintance with the literature of Shakespeare's times. Under the ministry of Lord Bute, Johnson obtained (1762) a pension of £300 a year, which he earned by his political pamphlets, "The False Alarm" (1770), and "Taxation no Tyranny" (1775). A visit to Scotland and the Hebrides (1773) occasioned his work, "A Journey to the Western Isles of Scotland" (1775). The suspicions therein expressed regarding the authenticity of Ossian's poems involved him in sharp controversy with Macpherson, their avowed editor, and their almost author. Johnson's last literary labour was his "Lives of the most Eminent English Poets" (London 1779-81). After a long illness, he died in London, the 15th of December, 1784. His works have been published several times in a collected form. As Don Quixote had his Sancho Panza, so Johnson had his Boswell, and never did Scotchman do his following more faithfully than that "Cany Scot" has portrayed all he said and all he could see of his laird. Few biographies are more amusing, nor, in its way, more instructive, than Boswell's "Life of Samuel Johnson, by James Boswell" (London, 1791, 2 vols. 4to). We lay before our readers a specimen of Johnson's poetry, and a specimen of his prose.

THE VANITY OF HUMAN WISHES.

Enlarge my life with multitude of days,
In health, and sickness, thus the suppliant prays;
Hides from himself his state, and shuns to know,
That life protracted is protracted woe.
Time hovers o'er, impatient to destroy,
And shuts up all the passages of joy;
In vain their gifts the bounteous seasons pour,
The fruit autumnal, and the vernal flower:
With listless eyes the dotard views the store,
He views and wonders that they please no more;
Now pall the tasteless meats, and joyless wines,
And luxury with sighs her slave resigns.
Approach, ye minstrels, try the soothing strain,
Diffuse the tuneful lenitives of pain.
No sounds, alas! would touch the impervious ear,
Though dancing mountains witnessed Orpheus near
Nor lute nor lyre his feeble powers attend,
Nor sweeter music of a virtuous friend;
But everlasting dictates crowd his tongue,
Perversely grave, or positively wrong.
The still returning tale, and lingering jest,
Perplex the fawning niece, and pampered guest,
While growing hopes scarce awe the gathering sneer
And scarce a legacy can bribe to hear;
The watchful guest still hints the last offence,
The daughter's petulance, the son's expense,
Improves his heady rage with treacherous skill,
And mould his passions till they make his will,
Unnumbered maladies his joints invade,
Lay siege to life, and press the dire blockade;
But unextinguished avarice still remains,
And dreaded losses aggravate his pains;
He turns, with anxious heart and crippled hands,
His bonds of debt, and mortgages of lands;
Or views his coffers with suspicious eyes,
Unlocks his gold, and counts it till he dies.
But grant the virtuous of a temperate prime,
Bless with an age exempt from scorn or crime,
An age that melts with unperceived decay,
And glides in modest innocence away;
Whose peaceful day benevolence endears,
Whose night congratulating conscience cheers:
The general favourite as the general friend;
Such age there is, and who shall wish its end?
Yet even on this her load misfortune flings,
To press the weary minutes' flagging wings;
New sorrow rises as the day returns,
A sister sickens, or a daughter mourns;
Now kindred merit fills the sable bier,
Now lacerated friendship claims a tear.
Year chases year, decay pursues decay,
Still drops some joy from withering life away;
New forms arise, and different views engage,
Superfluous lags the veteran on the stage,
Till pitying nature signs the last release,
And bids afflicted worth retire to peace.
But few there are whom hours like these await,
Who set unclouded in the gulphs of fate;
From Lydia's monarch should the search descend,
By Solon cautioned to regard his end,
In life's last scene what prodigies surprise,
Fears of the brave and follies of the wise?
From Marlb'rough's eyes the streams of dotage flow,
And Swift expires a driveller and a show.
Where then shall hope and fear their objects find?
Must dull suspense corrupt the stagnant mind?
Must helpless man, in ignorance sedate,
Roll darkling down the torrent of his fate?
Must no dislike alarm, no wishes rise,

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No cries invoke the mercies of the skies?
Inquirer cease; petitions yet remain,
Which heaven may hear, nor dream religion vain;
Still raise for good the supplicating voice,
But leave to heaven the measure and the choice.
Safe in his power, whose eyes discern afar
The secret ambush of a specious prayer,
Implore his aid, in his decisions rest,
Secure what e'er he gives, he gives the best.
Yet when the sense of sacred presence fires,
And strong devotion to the skies aspires,
Pour forth thy fervours for a healthful mind,
Obedient passions and a will resigned;
For love, which scarce collective man can fill;
For patience, sovereign o'er transmuted ill;
For faith, that, panting for a happier seat,
Counts death kind nature's signal of retreat:—
These goods for man the laws of heaven ordain,
These goods he grants, who grants the power of gain;
With these celestial wisdom calms the mind,
And makes the happiness she does not find.

THE JOURNEY OF LIFE.

"Obidah, the son of Abensina, left the caravansary early in the morning, and pursued his journey through the plains of Hindostan. He was fresh and vigorous with rest; he was animated with hope; he was incited by desire; he walked swiftly forward over the valleys, and saw the hills gradually rising before him. As he passed along, his ears were delighted with the morning song of the bird of paradise, he was fanned by the last flutters of the sinking breeze, and sprinkled with dew by groves of spices; he sometimes contemplated the towering height of the oak, monarch of the hills; and sometimes caught the gentle fragrance of the primrose, eldest daughter of the spring: all his senses were gratified, and all care was banished from his heart.

"Thus he went on till the sun approached his meridian, and the increasing heat preyed upon his strength; he then looked round about him for some more commodious path. He saw, on his right hand, a grove that seemed to wave its shades as a sign of invitation; he entered it, and found the coolness and verdure irresistibly pleasant.

"He did not, however, forget whither he was travelling, but found a narrow way bordered with flowers, which appeared to have the same direction with the main road, and was pleased that, by this happy experiment, he had found means to unite pleasure with business, and to gain the rewards of diligence without suffering its fatigues. He therefore still continued to walk for a time, without the least remission of his ardour, except that he was sometimes tempted to stop by the music of the birds, whom the heat had assembled in the shade; and sometimes amused himself with plucking the flowers that covered the banks on either side, or the fruits that hung upon the branches. At last the green path began to decline from its first tendency, and to wind among hills and thickets cooled with fountains, and murmuring with waterfalls. Here Obidah paused for a time, and began to consider whether it were longer safe to forsake the known and common track; but remembering that the heat was now in its greatest violence, and that the plain was dusty and uneven, he resolved to pursue the new path, which he supposed only to make a few meanders, in compliance with the varieties of the ground, and to end at last in the common road.

"Having thus calmed his solicitude, he renewed his pace, though he suspected that he was not gaining ground. The uneasiness of his mind inclined him to lay hold on every new object, and give way to every sensation that might soothe or divert him. He listened to every echo, he mounted every hill for a fresh prospect, he turned aside to every cascade, and pleased himself with tracing the course of a gentle river that rolled among the trees, and watered a large region with innumerable circumvolutions. In these amusements the hours passed away uncounted, his deviations had perplexed his memory, and he knew not towards what point to travel. He stood pensive and confused, afraid to go forward lest he should go wrong, yet conscious that the time of loitering was now past.

"While he was thus tortured with uncertainty, the sky was overspread with clouds, the day vanished from before him, and a sudden tempest gathered round his head. He was now roused by his danger to a quick and painful remembrance of his folly; he now saw how happiness is lost when ease is consulted; he lamented the unmanly impatience that prompted him to seek shelter in the grove, and despised the petty curiosity that led him on from trifle to trifle. While he was thus reflecting, the air grew blacker and a clap of thunder broke his meditation.

"He now resolved to do what remained yet in his power, to tread back the ground which he had passed, and try to find some issue where the wood might open into the plain. He prostrated himself on the ground, and commended his life to the lord of nature. He rose with confidence and tranquillity, and pressed on with his sabre in his hand, for the beasts of the desert were in motion, and on every hand were heard the mingled howls of rage and fear, and ravage and expiration; all the horrors of darkness and solitude surrounded him; the winds roared in the woods, and the torrents tumbled from the hills.

"Work'd into sudden rage by wintry show'rs,
Down the steep hill the roaring torrent pours;
The mountain shepherd hears the distant noise.

"Thus forlorn and distressed, he wandered through the wild, without knowing whither he was going, or whether he was every moment drawing nearer to safety or to destruction. At length not fear but labour began to overcome him; his breath grew short, and his knees trembled, and he was on the point of lying down in resignation to his fate, when he beheld through brambles the glimmer of a taper. He advanced towards the light, and finding that it proceeded from the cottage of a hermit, he called humbly at the door, and obtained admission. The old man set before him such provisions as he had collected for himself, on which Obidah fed with eagerness and gratitude.

"When the repast was over, 'Tell me,' said the hermit, 'by what chance thou hast been brought hither? I have been now twenty years an inhabitant of the wilderness, in which I never saw a man before.' Obidah then related the occurrences of his journey, without any concealment or palliation.

"'Son,' said the hermit, 'let the errors and follies, the dangers and escapes of this day, sink deep into thy heart. Remember, my son, that human life is the journey of a day. We rise in the morning of youth, full of vigour and full of expectation: we set forward with spirit and hope, with gaiety and with diligence, and travel on a while in the straight road of piety towards the mansions of rest. In a short time we remit our fervour, and endeavour to find some mitigation of our duty, and some more easy means of obtaining the same end. We then relax our vigour, and resolve no longer to be terrified with crimes at a distance, but rely upon our own constancy, and venture to approach what we resolve never to touch. We thus enter the bowers of ease, and repose in the shades of security. Here the heart softens, and vigilance subsides; we are then willing to enquire whether another advance cannot be made, and whether we may not, at least, turn our eyes upon the gardens of pleasure. We approach them with scruple and hesitation: we enter them, but enter timorous and trembling, and always hope to pass through them without losing the road of virtue; which we, for a while, keep in our sight, and to which we propose to return. But temptation succeeds temptation, and one compliance prepares us for another; we in time lose the happiness of innocence, and solace our disquiet with sensual gratifications. By degrees we let fall the remembrance of our original intention, and quit the only adequate object of rational desire. We entangle ourselves in business, immerse ourselves in luxury, and rove through the labyrinths of inconstancy, till the darkness of old age begins to invade us, and disease and anxiety obstruct our way. We then look back upon our lives with horror, with sorrow, with repentance; and wish, but too often vainly wish, that we had not forsaken the ways of virtue. Happy are they, my son, who shall learn from thy example not to despair, but shall remember, that though the day is past, and their strength is wasted, there yet remains one effort to be made; that reformation is never hopeless, nor sincere endeavours ever unassisted, that the wanderer may at length return after all his errors, and that he who implores strength and courage from above, shall find danger and difficulty give way before him. Go now, my son, to thy repose, commit thyself to the care of Omnipotence, and when the morning calls again to toil, begin anew thy journey, and thy life."

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LESSONS IN ARITHMETIC.—No. XXXVI.

LIFE INSURANCE.

A Life Insurance is a contract for the payment of a certain sum of money on the death of an individual, in consideration of a stipulated sum paid down, or, more commonly, of an annual premium, to be continued during the life of the assured.

The *average duration* of human life is often called the *Expectation of Life.** This is different in different countries, but it may be determined with great accuracy in any given country, by calculations founded on the register of birth and deaths in that country.

At birth, the expectation of life, according to the Carlisle Table, is 38·72 years; at 5, it is 51·25 y.; at 10, it is 48·82 y.; at 15, it is 45 y.; at 20, it is 41·46 y.; at 25, it is 37·86 y.; at 30, it is 34·34 y.; at 35, it is 31 y.; at 40, it is 27·81 y.; at 45, it is 24·46 y.; at 50, it is 21·11 y.; at 55, it is 17·58 y.; at 60, it is 14·34 y.; at 65, it is 11·79 y.; at 70, it is 9·19 y.; at 75, it is 7·01 y.; at 80, it is 5.51 y.; at 85, it is 4·12 y.; at 90, it is 3·28 y.; at 100, it is 2·28 y.

The *premium* paid for life insurance, like that for other insurance, is calculated at a certain per centage on the amount insured. The per centage varies according to the age and employment of the assured, and the time embraced in the policy.

At the age of 21 years, the per centage on a policy for life is from $1\frac{1}{10}$ to $2\frac{1}{2}$ per cent. per annum on the sum insured; for 7 years, it is from $\frac{4}{10}$ to $1\frac{1}{2}$ per cent. per annum; for 1 year, from $\frac{8}{10}$ to $1\frac{8}{10}$ per cent.

At 30, on a policy for life, it is from $2\frac{2}{10}$ to $2\frac{7}{10}$, per cent. per annum; for 7 years, from $1\frac{7}{10}$ to $1\frac{9}{10}$ per cent.; for 1 year, from $1\frac{1}{10}$ to $1\frac{3}{10}$ per cent.

At 40, on a policy for life, it is from $3\frac{1}{10}$ to $3\frac{1}{2}$ per cent.; for 7 years, from $1\frac{3}{10}$ to $2\frac{1}{10}$ per cent.; for 1 year, from $1\frac{3}{4}$ to $2\frac{1}{10}$ per cent.

At 50, on a policy for life, it is from $4\frac{1}{2}$ to $4\frac{6}{10}$ per cent.; for 7 years, from $2\frac{1}{10}$ to $3\frac{2}{10}$ per cent.; for 1 year, from $1\frac{1}{10}$ to $2\frac{1}{10}$ per cent.

At 60, on a policy for life, it is from $6\frac{3}{10}$ to 7 per cent.; for 7 years, from $4\frac{3}{10}$ to 5 per cent.; for 1 year, from $3\frac{1}{10}$ to $4\frac{4}{10}$ per cent.

28. A young man, at the age of 21 years, effected an insurance for £1,500 for life, at $2\frac{1}{10}$ per cent.: what was the annual premium? *Ans.* £31·50.

29. A man, at the age of 30, effected a life insurance for £2,700, for 7 years, at $1\frac{8}{10}$ per cent.: what was the annual premium?

30. At 60 years of age, a man effected a life insurance for 1 year for £5,750, at $6\frac{1}{2}$ per cent.: how much premium did he pay?

31. At 40 years of age, a man effected an insurance for £10,000 for life, at $3\frac{1}{2}$ per cent. per annum; he lived till he was 75 years old: which was the larger, the sum paid for insurance or the sum insured?

PROFIT AND LOSS.

Profit and Loss, in commerce, signify the sum *gained* or *lost* in ordinary business transactions. They are reckoned at a certain per cent. on the *purchase price* or *sum paid* for the articles under consideration.

Case I.

To find the Amount *of profit or loss, the purchase price and rate per cent. being given.*

Ex. 1. A grocer bought a lot of flour for £84, and sold it for 7 per cent. profit: how much did he make by his bargain?

Analysis.—Since he gained 7 per cent. on the cost of the flour, he must have gained $\frac{7}{100}$ of £84. Now, $\frac{7}{100}$ of £84 is $\frac{588}{100}$, and $\frac{1}{100}$ is 7 times as much, which is $\frac{4116}{100}$ = £5·88, or £5 17s. 7½d. *Ans.*

Or thus: If £1 gain $\frac{7}{100}$, £84 will gain 84 times as much; and £84 × ·07 = £5·88, or £5 17s. 7½d., the same as before. Hence,

To find the *amount of profit* or *loss*, when the purchase price and rate per cent. are given.

Multiply the purchase price by the given rate per cent. as in percentage; and the product will be the amount gained or lost by the transaction.

In order to obtain the *exact* profit and loss in mercantile operations, it is manifest that the *interest* on the cost or purchase price of the goods, during the time they have been on hand, and also for the time before payment is received, should be taken into consideration.

2. If I buy a piece of broadcloth for £120, and after keeping it 6 months, sell it at 8 per cent. advance on 6 months' credit, how much shall I gain if I pay 7 per cent. for the money invested? *Ans.* £1 4*s.*

3. If I buy a farm for £1,740, and sell it 8 per cent. less than cost, how much do I lose? *Ans.* £139 4*s.*

4. If you buy a house for £2,180, and sell it at 10 per cent. advance, how much will you gain by your bargain?

5. A merchant bought goods amounting to £340, and retailed them at 20 per cent. profit: how much did he make?

6. A trader bought a lot of flour for £6,235, and sold it 15 per cent. less than cost: what was his loss?

7. A speculator bought a quantity of cotton for £2,485, and sold it at $5\frac{1}{2}$ per cent. advance: how much did he make by the operation?

8. A man bought a lot of stores for £58,246, and sold them at 118 per cent. advance: how much did he gain?

9. A man bought uncultivated land amounting to £12,500, and after keeping it 10 years, sold it at 50 per cent. advance: allowing money to be worth 6 per cent., did he make or lose by the operation; and how much?

Case II.

To find how an article must be sold to gain or lose a specified rate per cent., the cost being given.

10. A man bought a building lot for £625, and afterwards sold it so as to gain 10 per cent.: how much did he sell it for?

Operation.

£625 purchase price.
·10 per cent. profit.

£62·50 profit.

£687·50 = £687 10s. selling price.

Since he gained 10 per cent., it is obvious he sold it for the purchase price together with 10 per cent. of that price. We therefore find 10 per cent. on the cost, and add it to itself.

11. A man bought a house for £840, and afterwards sold it so as to lose 10 per cent.: how much did he get for it?

Operation.

£840 purchase price.
·10 per cent. loss.

£84·00 sum lost.

£756·00 selling price.

Having found the sum lost, subtract it from the cost, and the remainder is obviously the selling price. Hence,

To find how any article must be sold, in order to *gain* or *lose* a given rate per cent. when the cost is given

First find the amount of profit or loss on the purchase price at the given rate, as in the last Case; then the amount thus found added to or subtracted from the purchase price, as the case may be, will give the selling price required.

12. A grocer bought a quantity of cheese for £130: for how much must he sell it, to gain 20 per cent.?

13. Bought a stock of goods for £3,460: for how much must they be sold, to gain $22\frac{1}{2}$ per cent.?

14. Bought a quantity of flour for £5,245: for how much must it be sold to gain 13 per cent.?

15. Bought 2,500 bales of cotton for £6,575, which were sold at a loss of $3\frac{1}{2}$ per cent.: what did they fetch?

Case III.

To find the Rate per cent. *of profit or loss, the cost and selling price being given.*

16. If a merchant buys a quantity of butter for £75, and sells it for £90, how much per cent. profit will he make?

Analysis.—Subtracting the cost from the selling price, shows that he gained £15. Now, £15 are $\frac{1}{5}$ of £75; therefore he gained $\frac{1}{5}$ of his *outlay*, or the purchase price of the goods.

* See Registers of London, Breslau, Northampton, etc.

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And $\frac{1}{4}\frac{5}{0}$ reduced to a decimal, is equal to 20 *hundredths*, or 20 per cent.

Or, we may reason thus: If £75 (outlay) gain £15, £1 will gain $\frac{1}{75}$ of £15. And £15÷75=·20, the eama as before.

Hence, to find the *rate per cent.* of profit or loss, when the *cost* and *selling prices* are given.

First find the amount gained or lost by subtraction; then make the gain or loss the numerator and the purchase price the denominator of a common fraction; reduce this fraction to a decimal, and the result will be the per cent. required.

Or, simply annex ciphers to the profit or loss, and divide it by the cost; the quotient will be the per cent.

As *per cent.* signifies *hundredths*, the *first two* decimal figures which occupy the place of hundredths, are properly the rate per cent.; the other decimals are *parts* of 1 per cent. After obtaining two decimal figures, there is sometimes an advantage in placing the remainder over the divisor, and annexing it to the decimals thus obtained.

It should be remembered that the per centage which is *gained* or *lost*, is always calculated on the *purchase* price, or the *sum paid* for the article, and not on the *selling* price, or *sum received*, as it is often supposed.

17. Bought a quantity of cotton at 6½d. per yard, and sold it at 8d.: how much per cent. was the profit?

18. Bought a quantity of calico, at 1s. per yard, and sold it at 1s. 0½d.: how much per cent. was the profit?

19. Bought a lot of corn, at 90s. per quarter, and sold it at 76s.: how much per cent. was the loss?

20. A man bought an estate for £4,325, and sold it for £5,216: how much per cent. did he make?

21. A speculator invested £7,500 in stocks, which he sold for £7,725: how much per cent. did he make by the operation?

Case IV.

To find the cost, *the selling price and the per cent. gained or lost being given.*

22. A man sold a lot of goods for £360, which was 20 per cent. more than cost: what did he pay for them?

Analysis.—The cost is $\frac{1}{1}\frac{0}{0}\frac{0}{0}$ of itself, and the gain is $\frac{2}{1}\frac{0}{0}\frac{0}{0}$ of the cost. Now, $\frac{1}{1}\frac{0}{0}\frac{0}{0}+\frac{2}{1}\frac{0}{0}\frac{0}{0}=\frac{1}{1}\frac{2}{0}\frac{0}{0}$; hence, the selling price is $\frac{1}{1}\frac{2}{0}\frac{0}{0}$ of the cost. The question, then, is this: £360 is $\frac{1}{1}\frac{2}{0}\frac{0}{0}$ of what sum? If £360 is $\frac{1}{1}\frac{2}{0}\frac{0}{0}$ of a certain sum, $\frac{1}{1}\frac{0}{0}\frac{0}{0}$ of that sum is $\frac{1}{1}\frac{2}{0}\frac{0}{0}$ of £360. Now, £360÷120=£3, and $\frac{1}{1}\frac{0}{0}\frac{0}{0}$=£3×100, which is £300. *Ans.*

Or, if we divide £360, the selling price, by the fraction $\frac{1}{1}\frac{2}{0}\frac{0}{0}$, the quotient, £300, will be the cost.

Proof.—£300×·20=£60·00 the gain;
and £300+£60=£360, the selling price.

23. A miller sold a lot of flour for £170, which was 15 per cent. less than cost: how much did the flour cost him?

Analysis.—Reasoning as before, the cost is $\frac{1}{1}\frac{0}{0}\frac{0}{0}$ of itself, and the loss is $\frac{1}{1}\frac{5}{0}\frac{0}{0}$ of the cost. Now, $\frac{1}{1}\frac{0}{0}\frac{0}{0}-\frac{1}{1}\frac{5}{0}\frac{0}{0}=\frac{8}{1}\frac{5}{0}\frac{0}{0}$; consequently the selling price is $\frac{8}{1}\frac{5}{0}\frac{0}{0}$ of the cost. The question, therefore, is this: £170 is $\frac{8}{1}\frac{5}{0}\frac{0}{0}$ of what sum? If £170 is $\frac{8}{1}\frac{5}{0}\frac{0}{0}$ of a certain sum, $\frac{1}{1}\frac{0}{0}\frac{0}{0}$ is $\frac{1}{8}\frac{7}{5}$ of £170. Now, £170÷85=£2, and $\frac{1}{1}\frac{0}{0}\frac{0}{0}$=£2×100, which is £200. *Ans.*

Or, thus: Since he lost 15 per cent., he realised only £·85 on £1 outlay. Therefore, if £·85, selling price, requires £1 outlay, £170, selling price, will require as many pounds' outlay as £·85 is contained times in £170; and £170÷·85=£200.

Proof.—£200×·15=£30·00, the loss;
and £200−£30=£170, the selling price. Hence,

To find the *cost* when the *selling price* and the rate per cent. *gained* or *lost* are given.

Divide the selling price by £1, *increased or diminished by the per centage gained or lost, as the case may be, and the quotient will be the cost required.*

Or, make the given per centage added to or subtracted from 100, *as the case may be, the numerator, and* 100 *the denominator of a common fraction; then divide the selling price by this fraction, and the quotient will be the cost.*

It is not unfrequently supposed that if we find the per centage on the selling price at the given rate, and add the per centage thus found to, or subtract it from, the selling price, as the case may be, the sum or remainder will be the cost. This is a mistake, and leads to serious errors in the result. It will easily be avoided by remembering that the basis on which *profit* and *loss* are calculated is always the *purchase price* or *sum paid* for the articles under consideration.

24. A grocer sold a quantity of sugar for £630, which was 15 per cent. more than it cost: what was the cost?

25. A man sold a carriage for £175, which was 15 per cent. less than it cost: what was the cost?

26. A man sold a farm for £2,360, which was 10 per cent. less than it cost: what did he give for it?

27. A dealer sold a library for £3,078, which was 12½ per cent. advance on the cost: how much did it cost him?

28. A merchant sold a cargo of crockery for £1,200, which was 8 per cent. less than it cost: what was the cost?

29. A commission merchant sold a lot of cloth for £7,265, which was 15 per cent. more than it cost: how much did it cost?

30. A builder sold a house for £1,745, which was 2 per cent. less than it cost: what was the cost?

31. A broker sold shares to the amount of £4,500, which was 5½ per cent. advance: what was the cost?

32. A manufacturer sold a quantity of carpeting for £6,324, which was 50 per cent. more than the cost of the materials: what did the materials cost?

LESSONS IN GREEK.—No. LVII.

By John R. Beard, D.D.

Enlargement of the Predicate; the Single Accusative.

Enlargement of the Predicate by the addition of an Attribute.

The attribute added to the predicate is explanatory when it presents the idea of the predicate more definitely and prominently, by giving it relations in regard to time, place, cause, and consequences, especially by giving the accessory circumstances connected therewith. As forms of expression for this kind of attribute, serve in part adverbs, and in part the dependant cases of substantives, both with and without prepositions, and partly again adjectives, which stand in concord with the subject. The adverb needs no special rules for its use; the use of the oblique or dependent case to denote an attribute, will be treated of when we come to the cases in general: here, therefore, we have to speak only of the instances in which the attribute is an adjective.

The addition of an explanatory attributive adjective is necessary when the idea in the predicate is of too general a kind to be expressed without special aid, or contains a comparison which has its full meaning only in virtue of the point of comparison being stated. Predicates of the kind—besides *εἶναι* and *γίγνεσθαι*—are the verbs *μένειν*, to remain; *καταστῆναι*, to be appointed; *δοκεῖν*, to appear; *φαίνεσθαι*, to show one's self; *εὑρίσκεσθαι*, to be found; *κρίνεσθαι*, to be judged, considered; *νομίζεσθαι*, to be accounted: *ὑπολαμβάνεσθαι*, to be held; *καλεῖσθαι*, to be called; *ὀνομάζεσθαι*, to be named; *προσαγορεύεσθαι*, to be addressed as; *λέγεσθαι*, to be said; *ἀκούειν*, *literally*, to hear, that is, to be spoken of; *ἀποδείκνυσθαι*, to be appointed; *καθίστασθαι*, to be set or established; *αἱρεῖσθαι*, to be chosen; *χειροτονεῖσθαι*, to be elected. All these verbs contain severally only an incomplete idea, which receives what is necessary to fill it up from an attribute. For instance:—

Οἱ Πέρσαι ἐνομίζοντο ἀλκιμώτατοι
The Persians were accounted *very brave*.

In this sentence, the predicate *ἐνομίζοντο*, is incomplete without *ἀλκιμώτατοι*. The Persians were accounted—were accounted what? *Very brave.* Not until you have added the attributive adjective, does the predicate fully declare of the subject that which you intend.

Sometimes the attribute is a noun, before the rendering of which, *as* may be placed, *e.g.*

Παρὰ βασιλέως ἄνδρες πέντε ἦκον ἄγγελοι
Five men came *as* messengers from the king.

As in intransitive and passive verbs, the attribute of the predicate agrees with the subject, so with transitive verbs may the explanatory attribute be applied to the object, and then stands in concord with it. Consequently, not only the verbs given above, but also many others take an explanatory attri-

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hute in the accusative, in addition to the accusative of the object. Thie grammatical reference of the attribute belonging to the predicate, to the subject or the object, caused adjectives to be employed in Greek, when in English adverbs would be used. This takes place—first, with words signifying Inclination or disinclination, as *ἑκων*, *ἑκουσιος*, willing; *ακων*, unwilling; *ἐθελοντης*, desiring; *ἐθελουσιος*, *ἐθελων*, desiring; *ασμενος*, pleased, glad, and others; instead of willingly, gladly, etc.: secondly, with words that denote a series, in which cases, instead of the corresponding adverbs, the Greeks use these adjectives, *πρωτερος*, *πρῶτος*, first; *ὑστερος*, later; *ὑοτατος*, next: *τελευταῖος*, last, etc.: thirdly, with words expressive of time and seasons of the day; accordingly the adjectives, *ορθριος*, at daybreak; *ἐωθινος*, early in the morning; *ἑσπεριος*, in the evening; *οψιος*, late; *νυχιος*, by night; *παννυχιος*, all night; *χρονιος*, after a time; *δευτεραῖος*, on the second day; *τριταῖος*, on the third day; *τεταρταῖος*, on the fourth day: and fourthly, with terms of size and measure.

If the predicate is set forth by a comparative, mention, for the full understanding of the proposition, must be made of the object with which the subject is compared. The compared object is introduced as standing over against the subject, by means of the particle *η*, than, or by means of the genitive case; *e.g.*

The particle *η*	*κρεῖττον σιωπᾶν ἐστιν η λαλεῖν*
The genitive	*το σιωπᾶν κρεῖττον ἐστι του λαλεῖν*
	Silence is better than speaking.

This denoting of the compared object by means of the genitive, the Greeks employ not only in cases in which the use of the form with *η* would give the nominative or the accusative, but also, when the dative or the genitive with *η* would appear; *e.g.*

Ἐξεστιν ἡμιν μαλλον ἑτερων καθ' ἡσυχιαν βουλευειν
It is necessary for us more than others to consult in peace.

The Greek, if fully expanded with *η*, would be *ἐξεστιν ἡμιν μαλλον η ἐξεστιν ἑτεροις*, etc.

The genitive may also, as in direct comparisons, be employed with words which, without properly belonging to the class of comparatives, set forth a quality comparatively. Thus it is with proportionals ending in *πλασιος*; also with *περιττος*, *διαφερων*, etc.

As peculiarities in the Greek use of the comparative, the following require attention: First, the comparative without the compared object, is employed when you have in your thoughts the ordinary or the required amount of the quality as the point of comparison; in which case, we in English employ the particles too, too much, somewhat, rather, etc.: thus, *οἰνος ἀκρατεστερος*, means wine that is too strong; *κακιον απαλλαττειν*, to get off rather ill; *αι και γελοιοτερον εἰπεῖν*, to say something rather laughable. In opposition to this, the positive is used in Greek where we should employ the adverb *too*, as:

Το ὑδωρ ψυχρον ὡστε λουσασθαι ἐστιν
The water is *too* cold to bathe in.

Secondly, when the two qualities of an object are so stated that the one surpasses the other, both in Greek are in the comparative, while in English only the superior is in the comparative, *e.g.*

Σοφωτερος η ἀμαθεστερος δοκεῖ εἶναι
He appears to be more (rather) wise than untaught.

The Enlargement of the Predicate by an Object.

The second method for the internal enlargement of the predicate, is the adding of an object to it.

By object is intended that on which the action of the subject falls. The relation of the subject to the object is either *immediate*, so that the action of the subject passes to the object without any intermediate term; or the relation is *mediate*, so that the two are connected by some medium. Accordingly, we have to distinguish between an immediate or near object, and a mediate or remote object. The object always appears as under an influence from the subject, and consequently as dependent on the subject. This dependence of one idea on another is marked in this way: the dependent idea takes a form which intimates that it accommodates itself to another idea and becomes subordinate to it. The external means for the indication of this change is the alteration of the case-endings (inflexion), the particulars of which have been learnt in the declensions. One idea appears dependent on another when it serves to denote an attributive accessory.

Of the three oblique cases of the Greek, the accusative is chiefly employed to indicate the near object, the dative to indicate the remote, and the genitive specially to express attributive accessories.

Import and Use of the Accusative.

The accusative shows that an object is under the immediate influence of another object, and consequently serves:

1. To denote the near or immediate object.

2. To denote the end towards which a movement is directed, and the space over which a movement extends, in reference to locality, as well as to time.

The Accusative to denote the Object.

1. *The Single Accusative.*—All verbs which signify action (transitives), put that which is immediately affected by that action, or which is thereby brought into existence, into the accusative case; *e.g.*

Οἱ Ἑλληνες ενικησαν τους Περσας
The Greeks conquered *the Persians.*

The application of the accusative in Greek is wider than it is in English. In poetry especially, objects are often employed with intransitive verbs, in order to show the influence or result which ensues from the verbal condition. Thus with *ὀρχεῖσθαι*, to dance, and *κινεῖσθαι*, to play in pantomime, is found the accusative of the person set forth or imitated in the dance or the mime, as, *ὀρχεῖσθαι τον Ἑκτορα*, *κινεῖσθαι τα τοιαῦτα*. So with *ἐιρκεσθαι*, *βλεπειν*, *λευσσειν*, *ὁραν*, *ἰδειν*, to see, to behold; *λαμπειν*, *αστραπτειν*, to shine, to lighten; *πνεῖν*, to blow; *φυσᾶν*, to breathe; *φθεγγεσθαι*, *ηχεῖν*, to sound; *ῥεῖν*, to flow; *στραζειν*, *τεγγειν*, to drop; the Greeks use the accusative of the thing, as for instance:

Πυρ ὀφθαλμοισι δεδορκως
Looking (darting) fire from his eyes.

So *φονον βλεπων*, looking murder; that is, showing in his look a design to murder. A similar usage prevails in these verbs: *ὁρᾶν αλκην*, to look strength, or courage; *αρχτιον ἰδειν*, to look like a fool; *δειρεσθαι ἑτεινον*, *ομῳδαλεον*, to look terrible; *σεμνον βλεπειν*, to look venerable; *λαμπειν αστερα*, *σελας*, to throw out splendour; *αστραπτειν σελας*, to lighten brilliantly; *πνεῖν μενεα*, to *breathe* rage (as we in English say), so *πνεῖν πυρ*, *φλογα*, to breathe out fire; *ῥεῖν γαλα*, to flow with milk; *στραζειν* or *τεγγειν δακρυα*, to shed tears; *αἱμα*, to drop blood; *ηχεῖν ασημον*, to utter a faint sound; *φθεγγεσθαι ταπεινον*, to speak humbly.

In determining the case of the object of a verb, you must regard the Greek usage rather than the English, for the two do not always correspond. Thus we say, to do good *to*; but the Greeks in such a case would employ the accusative. Let the following deviations from the English construction be studied and committed to memory: *εὖ* or *καλῶς ποιεῖν* or *ἐρᾶν*, to do good to; *κακῶς ποιειν*, *κακοποιεῖν*, *κακοῦν*, or *κακουργεῖν*, to do ill to, to injure; *εὖ* or *καλῶς λεγειν*, or *εὐλογεῖν*, to speak well of; *κακῶς λεγειν*, *κακολογεῖν*, to speak ill of; *επιτροπευειν*, to be a guardian to; *δορυφορεῖν*, to be a spear-bearer to, to be one of a body-guard; *φευγειν*, to flee from; *αποδιδρασκειν*, to run away from, *δραπετευειν*, to flee from; *φυλαττεσθαι*, to guard against; *λανθανειν*, to lie hid from; *φθανειν*, to get in advance of; *μενειν*, to remain for;—all of which in Greek govern an accusative.

Many verbs, which in English are used intransitively, admit in Greek of a transitive application, in consequence of which they take an accusative as their object. Such verbs are, *δακρυειν*, to weep for; *οιμωζειν*, *οὐρισεσθαι*, *ολοφυρεσθαι*, to moan, lament; *πενθειν*, *θρηνειν*, *κατεισεσθαι*, to mourn; *e.g.*

Τους ἀποθανοντας δακρυουσιν οἱ οικειοι
The domestics weep for the departed.

In the same way *πλεῖν*, to sail, to travel by sea, acquires a transitive application, and takes an accusative of the part on which the journeying goes on, *e.g.* *πλεῖν θαλασσαν*, *πλεῖν πεντον*, etc. Following the same analogy, verbs which

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signify to pass over, take an accusative of the space or object over which the passage is made, *e.g.* *περαιοῦσθαι, περαν, διαβαινειν ποταμον, θαλασσαν*, to cross a river, go over the sea: so *ὑπερβαινειν ορος, τειχος*, to pass over a mountain, to get over a wall, etc. Similarly the verbs *ἰέναι, ελθειν, βαδιζειν, βαινειν, πορευεσθαι*, to go, and *τρεχειν, θεῖν*, to run, take an accusative of the ground you pass over, *e. g. τρεχειν το σταδιον*, to run over the course; *πορευεσθαι ὁδον*, to travel; *ἰέναι ορθιον*, to go by a steep way; *ἰέναι ομαλις*, to travel over a plain; *θεῖν τα αναντη*, to run up a rising ground. So we find *αναν θρονον θασσειν*, to sit (on) a seat; and *ἵζεσθαι κρηνας*, to settle (at) a fountain; *οικεῖν*, meaning to inhabit, to dwell, may signify to direct, *e. g.*

Δεῖ γυναῖκα εὖ οικεῖν την οικιαν
A woman ought to manage her household well.

It is owing to this extended application of intransitive verbs that some take as their object in the accusative case, a noun borrowed from the idea which they themselves convey. Thus we say, "to fight a fight" (2 Tim. iv. 7), "to run a race," "to dream a dream," "to see a sight," only with the Greeks the practice is more common and more various. Instances are given in the exercise. I may here specify and explain one or two of the more peculiar; the Greeks said *φορον φερειν*, to bear a burden, in the sense of to pay a tribute; *πομπην πεμπειν*, to send a sending, or a following, that is to get up a procession: so *φυλακας φυλαττειν*, to guard a guard, that is, to hold a watch, to keep guard.

The application is extended to neuter adjectives, giving rise to forms of speech which require explanation, *e.g. τουτο ἁμαρτανειν*, that is, *τουτο το ἁμαρτημα ἁμαρτανειν*, to commit this error, to sin this sin, to sin in this; *μεγαλα ἁμαρτανειν*, to commit great sins; *ἐεῖσθαι μετρια*, to make moderate requests. The neuter must in the translation be sometimes made dependent on a preposition, as

Τί χρησομεθα τῃ νικῃ;
In what way shall we turn the victory to account?

The accusative of the abstract object may stand with the middle or passive as well as the active, *e.g.*

Πολλας λωβας λωβᾶται ὁ ανθρωπος
The man endures many a disgrace.

So after adjectives and nouns which have a verbal force, may stand an accusative of the object; in which cases some freedom must be taken in the translation, *e g.*

Δοῦλος ἐστι τας μεγιστας δουλειας
He is a slave of the lowest kind.

As the Greeks said, *νικᾶν νικην*, to gain a victory; so by an extension of the idiom, they said, *νικᾶν ἀγῶνα*, to be superior in a contest; *νικᾶν πυγμην*, to beat in boxing; *νικᾶν παλην*, to conquer in wrestling; *νικᾶν Ολυμπια*, to conquer in the Olympic games; *νικᾶν δικην*, to gain a lawsuit; *νικᾶν γνωμην*, to make your opinion prevail; *νικᾶν ψηφισμα*, to gain a majority of votes; so also *ἡττασθαι ἡτταν*, to suffer a defeat; *ἡττασθαι μαχην*, to be conquered in a battle. Of a similar nature are the expressions, *ἑστιᾶν γαμους*, to celebrate a marriage; *ἑστιᾶν γενεθλια*, to keep a birthday; further, *θυειν Διονυσια*, to sacrifice to Dionysos (Bacchus). A yet greater extension is found in the forms, *αισχυνεσθαι τινα*, to be ashamed before (to reverence) a person; *θαῤῥεῖν τινα*, to have confidence towards (in the presence of) a person.

Hence may be explained what is called *the accusative of the part*; and this accusative may be expanded into *the accusative of the more exact determination*; that is, an accusative which defines the object to which the predicate relates, *e.g.*

Accusative of the part: *Τον δακτυλον αλγῶ.*
I have a pain *in my thumb*.

Accusative of exact determination:

Πινδαρος Βοιωτος ην την πατριδα
Pindar was a Boeotian *as to country*.

Nouns of measure, as depth (*τα βαθος*), height (*το ὑψος*), breadth (*το ευρος*), are in the same manner put in the accusative to signify the exact relation of the object to the predicate. So, where we say "by name," the Greeks simply used an accusative (*ονομα*) of exact determination, *e.g.*

Οἱ Ἕλληνες αφικοντο επι τον Ἅρπασον ποταμον, ευρος τεττταρων πλεθρων
The Greeks came to the river Harpasus, which was *four feet broad*.

Λυσανδρος προσεβαλε πολει, ονομα Κεδρειας
Lysander fell upon a city, *by name* Cedreæ.

Let it be observed, that while *ονομα* is in the accusative, the proper name agrees in the dative with *πολει*.

Exercises.—Greek-English.

*Οἱ ὑπερ τα πεντηκοντα ετη γεγονοτες καλοῦνται γεραιτεροι. Οἱ νομοι διαμενουσιν ακινητοι. Αλκιβιαδης κεχειροτονηται στρατηγος. Κυρος στρατηγος παντων απεδειχθη. Ευδαιμων φαινεται ὁ ανηρ. Ἵπποι ηγοντο θυματα τῳ ἡλιῳ. Οἱ Λακεδαιμονιοι συμμαχοι παρεγενοντο τοις Μιτυληναιοις. Πενητας ουδεις βουλεται κτᾶσθαι φιλους. Εξεστιν ὑμιν τους Αθηναιους λαβειν συμμαχους. Ουτοι τα χρηματ' ιδια κεκτηνται βροτοι. Φιλιππον χαλκοῦν εστησαν πολεις Ἑλληνιδες. Δικαια ἐρασας αμμαχον τευξει θεοῦ (or) συμμαχῳ χρησει θεῷ (or) συμμαχον ἑξεις θειον. Επι τα κακα ουδεις ἑκων ερχεται. Αἱ πολεις ἑκουσαι προσεγενοντο Κυρῳ. Ακων ἁμαρτων ουδεις ανθρωπων κακος. Εγω σε ατιμενος ἑωρακα. Τους νεκρους ὑποαπονἑους ανελεσθαι επεταξεν. Δοκῶ μοι, ει μη προτερος ἑωρακειν αυτον η εκεῖνος εμε, αφωνος αν γενεσθαι. Αυτος εφιψομαι τελευταιος. Ταχυ γαρ πρῶτος, αν δεῃ, παρεσομαι. Σποιδας λυουσιν ουχ ωι αμυνομενοι, αλλ' οἱ προτεροι επιοντες. Ἡ εγκρατεια μονη ποιοῦσα καρτεριαν, μονη και ἡδεισθαι ποιεῖ. Εξ Αβδηρων εις Ιστρον ανηρ ευζωνος ἐνδεκαταῖος τελεῖ. Ορθριος ἤκεν ὁ αγγελος. Ὁ Ασωπος ποταμος εῤῥυη μιλας. Μεγας ὁ Φιλιππος ηὐξηται. Ηιρητο τα ὑψος τοῦ τειχους μεγα. Δια τουτων ηρθη μεγας. Τί εστι μειζον αγαθον ανθρωποις ὑγιειας; Αριστειδης εργα λαμπροτερα απεδειξατο του Αλκιβιαδου. Λυσιτελεῖν πολλοι νομιζουσι την αδικιαν μαλλον τῆς δικαιοσυνης. Κακιστος, οστις περι πλειονος τους κακουργους της πατριδος ποιεῖται. Αθλιωτερον εστι μη ὑγιοῦς σωματος μη ὑγιεῖ ψυχῃ ξυνοικεῖν. Ὁ ου δικαιος, καν αμεινονος πατρος Ζηνος πεφυκῃ, δεσγενης ειναι δοκεῖ. Κοινου κινδυνου τοῖς Ἕλλησι περιστανται, οἱ Αθηναῖοι διπλασια των αλλων εις την απαντων σωτηριαν παρισχοντο. Πολλα πλασιους ὑμων αυτων ενικᾶτε συν τοις Θεοῖς. Επειδαν κτησωμαι περιττα τῶν εμοι αρκουντων, τουτοις τας ενδειας των φιλων εξακοῖμαι. Αναγκαιον ην συντομωτερον η ασφιστερον διαλεχθῆναι. Ολιγοι εσμεν ὡς εγκρατεῖς εἰναι αυτῶν. Θησευς την Αριαδνην εν Ναξῳ κατελιπεν. Οἱ θεοι αυτε σιτον εσθιουσιν, ουτε πινουσιν οἶνον. Φειδιας εποιησε τον Δια. Θεος εφυσε τους ανθρωπους. Ἡ πενια λυπην εργαζεται. Ὁ κολακευων τους φιλους πολλα αδικεῖ και βλαπτει αυτους. Ῥᾴδιον εστι κακῶς ποιεῖν ανθρωπους η εὖ. Εν τοις κακοις τους φιλους ενεργειτε. Εὖ λεγε τον εὖ λεγοντα. Μη δρα τους τεθνηκοτας κακῶς. Πολλακις και δοῦλοι τιμωρουνται τους αδικους δεσποτας. Οἱ σοφισται λωβῶνται τους νεους. Οἱ πολεται δορυφορουσιν αλληλους ανευ μισθου. Πλειταρχον τον Λεανδου οντα βασιλεα και νεον ετι ὁ Παυσανιας επιτροπευεν. Μη φευγε τον ὑπερ τῆς πατριδος κινδυνον. Δουλος αποδρας τον δεσποτην θανατου ενοχος εστιν αξιος. Οἱ πατερες προνοοῦσι των παιδων, ὁπως μηποτε αυτους ταγαθα επιλειψει. Θεους λαθειν αδυνατον. Εκλειπει με ἡ ελπις. Εῤῥθης μοι ερωμενος. Οἱ των πραγματων καιροι ου μενουσι την ὑμετεραν βραδυτητα. Πολλοι δη ἐδακρυσαν τα ἑαυτων κακα. Οδυρομαι την ανοησιαν σου. Ἡ πολις βραχια ῆσθησαι μεγαλα ζημιωσεται. Διῖ ταυτα λυπεισθαι και ταυτα χαιριν τοῖς πολλοις. Βοηθησω σοι τα δικαια; Πολυ μειω ευφραινονται οἱ τυραννοι τῶν μετριως ἐ.αγοντων ἰδιωτῶν, πολυ δε πλειω και μειζω λυποῦνται. Δεομαι δικαιαν δεησιν. Οἱ ανδρειοι ουτ' αισχρους φοβους φοβοῦνται, ουτ' αισχρα θαῤῥοῦ

θαρροῦσιν. Πολιορκοῦμαι δεινην πολιορκιαν. Κακος ειμι πασαν κακιαν. Καμνω τους ὀφθαλμους. Το μεν σῶμα ποντῖ, τας δε φρενας ὑγιαινει. Φῦναι ὁ Κυρος λεγεται εἶδος μεν καλλιστος, ψυχην δε φιλανθρωποτατος. Μαχαων και Ποδαλειριος εγενοντο και τεχνας και λογους και πολεμους αγαθοι. Διογενει δουλω ην ονομα Μανης. Τι των ἁπαντων συ χρησιμος εἶ; Ανδος εστι το γενος. Παντα σοφον ουκ οἷον τε ανθρωπον εἶναι. Πεντε ποδων το βαθος εστι ὁ ποταμος. Δεινοτατος εστι την φιλοσοφιαν. Ἥδε ἡ παρθενος καλη εστι το εἶδος. Ἕλληνες ἐσμεν το γενος. Δεινος εστι την μουσικην. Εὖ ἐχομεν τα σωματα. Βασιλευς και Ἕλληνες απειχον αλληλων τριακοντα σταδια. Οἱ κολακες Αλεξανδρον θεον ωνομαζεν. Ελαβε τουτο ἐωρον. Ειπε μοι συ, τι την πολιν αγαθον πεποιηκας. Ἡ πενια τοῦ πλουτου παρεχει βελτιονας ανδρας και την γνωμην και την ἰδιαν. Θεμιστοκλης και Περικλης και Κιμων τα πολιτικα δεινοι γεγονασι.

VOCABULARY, ETC.

Χαλκειος (χαλκοῦς), of brass; they set up a brazen image of Philip.

Ὑποσπονδος, ον, during a truce (ὑπο and σπονδη).

Τελεω, I accomplish, perform the journey.

Αἱρεω, I choose; αἰρω, I lift up; ηρθη μεγας, was greatly elated.

Ποιεῖσθαι περι πλειονος, to consider of importance, value, make much of.

Θαῤῥεω, I am bold, confident, daring.

Give the mood, tense, and person of the following verbs, and conjugate each form separately:—παρεσχοντο, κτησωμαι, διαλεχθῆναι, ἁρα, τεθνηκοτας, ζημιωσεται, ἐφθης, ηρθη, ῥρετο, ωνομαζον.

LESSONS IN SPANISH.—No. XII.

CONJUGATION.—*Continued.*

A Paradigm of the three Conjugations.* The figures refer to the first, second, and third persons:—

INFINITIVE MOOD.

1st Conjugation.	2nd Conjugation.	3rd Conjugation.
Present.		
Amár, to love.	*Comér*, to eat.	*Vivír*, to live.
Past Participle.		
Amado, loved.	*Comido*, eaten.	*Vivido*, lived.
Past		
Habér amado, to heve loved	*Habér comido*, to have eaten.	*Habér vivido*, to have lived.
Present Gerund.		
Amando, loving.	*Comiendo*, eating.	*Viviendo*, living.
Past Gerund.		
Habiendo amado, having loved.	*Habiendo comido*, heving eaten.	*Habiendo vivido*, having lived.

* In these model verbs of the three conjugations, the persons of every tense are to be accented on the syllable next to the last, except where the marked accent is placed over some other syllable.

INDICATIVE MOOD.

1st Conjugation.

Present.
1 *Amo*, I love.
2 *Amas*, thou lovest.
3 *Ama*, he loves.
1 *Amamos*, we love.
2 *Amáis*, you love.
3 *Aman*, they love.

Imperfect.
1 *Amaba*, I was loving.
2 *Amabas*, thou wast loving.
3 *Amaba*, he was loving.
1 *Amábamos*, we were loving.
2 *Amábais*, you were loving.
3 *Amaban*, they were loving.

Perfect Definite.
1 *Amé*, I loved.
2 *Amaste*, thou lovedst.
3 *Amó*, he loved.
1 *Amamos*, we loved.
2 *Amásteis*, you loved.
3 *Amaron*, they loved.

Perfect Indefinite.
1 *He amado*, I have loved.
2 *Has amado*, thou hast loved.
3 *Ha amado*, he has loved.
1 *Hemos amado*, we heve loved.
2 *Habéis amado*, you have loved.
3 *Han amado*, they hevo loved.

First Pluperfect.
1 *Habia amado*, I had loved.
2 *Habias amado*, thou hadst lovad.
3 *Habia amado*, he hed loved.
1 *Habiamos amado*, we had loved.
2 *Habiais amado*, you hed loved
3 *Habian amado*, they had loved.

Second Pluperfect.
1 *Hube amado*, I hed loved.
2 *Hubiste amado*, thou hadst loved.
3 *Hubo amado*, he had loved.
1 *Hubimos amado*, we had loved.
2 *Hubisteis amado*, you had loved.
3 *Hubieron amado*, they hed loved.

First Future.
1 *Amaré*, I shall or will love.
2 *Amarás*, thou wilt love.
3 *Amará*, he will love.
1 *Amaremos*, we shall love.
2 *Amaréis*, you will love.
3 *Amarán*, they will love.

Second Future.
1 *Habré amado*, I shall have loved.
2 *Habrás amado*, thou wilt have loved.
3 *Habrá amado*, he will have loved.
1 *Habremos amado*, we shall have loved.
2 *Habréis amado*, you will have loved.
3 *Habrán amado*, they will have loved.

2nd Conjugation.

Present.
1 *Como*, I eat.
2 *Comes*,
3 *Come*,
1 *Comemos*,
2 *Coméis*,
3 *Comen*,

Imperfect.
1 *Comia*, I was eating.
2 *Comias*,
3 *Comia*,
1 *Comiamos*,
2 *Comiais*,
3 *Comian*,

Perfect Definite.
1 *Comí*, I ate.
2 *Comiste*,
3 *Comió*,
1 *Comimos*,
2 *Comisteis*,
3 *Comieron*,

Perfect Indefinite.
1 *He comido*, I heve eaten.
2 *Has comido*,
3 *Ha comido*,
1 *Hemos comido*,
2 *Habéis comido*,
3 *Han comido*,

First Pluperfect.
1 *Habia comido*, I had eeten.
2 *Habias comida*,
3 *Habia comido*,
1 *Habiamos comida*,
2 *Habiais comido*,
3 *Habian comido*,

Second Pluperfect.
1 *Hube comido*, I had eaten.
2 *Hubiste comido*,
3 *Hubo comido*,
1 *Hubimos comido*,
2 *Hubisteis comido*,
3 *Hubieron comido*,

First Future.
1 *Comeré*, I shall eat.
2 *Comerás*,
3 *Comerá*,
1 *Comeremos*,
2 *Comeréis*,
3 *Comerán*,

Second Future.
1 *Habré comido*, I shall have eaten.
2 *Habrás comido*,
3 *Habrá comido*,
1 *Habremos comido*,
2 *Habréis comido*,
3 *Habrán comido*,

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3rd Conjugation.

Present.

1 *Vivo*, I live.
2 *Vives*,
3 *Vive*,
1 *Vivimos*,
2 *Vivís*,
3 *Viven*,

Imperfect.

1 *Vivia*, I was living.
2 *Vivías*,
3 *Vivía*,
1 *Viviamos*,
2 *Viviais*,
3 *Vivian*,

Perfect Definite.

1 *Viví*, I lived.
2 *Viviste*,
3 *Vivió*,
1 *Vivimos*,
2 *Vivisteis*,
3 *Vivieron*,

Perfect Indefinite.

1 *He vivido*, I have lived.
2 *Has vivido*,
3 *Ha vivido*,
1 *Hemos vivido*,
2 *Habéis vivido*,
3 *Han vivido*,

First Pluperfect.

1 *Había vivido*, I had lived.
2 *Habías vivido*,
3 *Había vivido*,
1 *Habíamos vivido*,
2 *Habíais vivido*,
3 *Habían vivido*,

Second Pluperfect.

1 *Hube vivido*, I hed lived.
2 *Hubiste vivido*,
3 *Hubo vivido*,
1 *Hubimos vivido*,
2 *Hubisteis vivido*,
3 *Hubieron vivido*,

First Future.

1 *Viviré*, I shall live.
2 *Vivirás*,
3 *Vivirá*,
1 *Viviremos*,
2 *Viviréis*,
3 *Vivirán*,

Second Future.

1 *Habré vivido*, I shell have
2 *Habrás vivido*, [lived.
3 *Habrá vivido*,
1 *Habremos vivido*,
2 *Habréis vivido*,
3 *Habran vivido*,

Imperative Mood.

1st Conjugation.

1 *Ame yo*, let me love (or, may I love).
2 *Ama tú*, love thou.
3 *Ame él*, let him love.
1 *Amemos nosótros*, let ue love.
2 *Amad vosótros*, love you.
3 *Amen ellos*, let them love.

2nd Conjugation.

1 *Coma yo*, let me eat.
2 *Coma tú*,
3 *Coma él*,
1 *Comamos nosótros*,
2 *Comed vosótros*,
3 *Coman ellos*,

3rd Conjugation.

1 *Viva yo*, let me live.
2 *Vive tú*,
3 *Viva él*,
1 *Vivamos nosótros*,
2 *Vivid vosótros*,
3 *Vivan ellos*,

Subjunctive Mood.

1st Conjugation.

Present.

1 *Ame*, I may love.
2 *Ames*, thou mayst love.
3 *Ame*, he mey love.
1 *Amemos*, we may love.
2 *Améis*, you may love.
3 *Amen*, they may love.

Imperfect.

1 *Amara, amaría, amase*, I would, ehould, might love.
2 *Amaras, amarías, amases*, thou wouldst, shouldst, mightst love.
3 *Amara, amaría, amase*, he would, should, might love.
1 *Amáramos, amaríamos, amásemos*, we would, should, might love.
2 *Amárais, amaríais, amáseis*, you would, should, might love.
3 *Amaran, amarían, amasen*, they would, should, might love.

Perfect Iodefinite.

1 *Haya amado*, I may have loved.
2 *Hayas amado*, thou meyst have loved.
3 *Haya amado*, he may have loved.
1 *Hayamos amado*, we mey heve loved.
2 *Háyais amado*, you may have loved.
3 *Hayan amado*, they mey have loved.

Pluperfect.

1 *Hubiera, habría, hubiese amado*, I would, ehould, might have loved.
2 *Hubieras, habrías, hubieses amado*, thou wouldst, shouldst, mightst have loved.
3 *Hubiera, habría, hubiese amado*, he would, ehould, might have loved.
1 *Hubiéramos, habríamos, hubiésemos amado*, we would, should, might heve loved.
2 *Hubiérais, habríais, hubieseis amado*, you would, should, might have loved.
3 *Hubieran, habrían, hubiesen amado*, they would, should, might have loved.

First Future.

1 *Si amare*, if I ehould love.
2 *Si amares*, if thou ehouldst love.
3 *Si amare*, if he should love.
1 *Si amáremos*, if we should love.
2 *Si amáreis*, if you ehould love.
3 *Si amaren*, if they should love.

Second Future.

1 *Si hubiere amado*, if I should have loved.
2 *Si hubieres amado*, if thou ehouldst have loved.
3 *Si hubiere amado*, if he should have loved.
1 *Si hubiéremos amado*, if we ehould have loved.
2 *Si hubiéreis amado*, if you should have loved.
3 *Si hubieren amado*, if they should heve loved.

2nd Conjugation.

Present.

1 *Coma*, I may eat.
2 *Comas*,
3 *Coma*,
1 *Comamos*,
2 *Comáis*,
3 *Coman*,

Imperfect.

1 *Comiera, comería, comiese*, I would, should, might eat.
2 *Comieras, comerías, comieses*,
3 *Comiera, comería, comiese*,
1 *Comiéramos, comeríamos, comiésemos*,
2 *Comiérais, comeríais, comieseis*,
3 *Comieran, comerían, comiesen*,

Perfect Indefinite.

1 *Haya comido*, I mey have eaten.
2 *Hayas comido*,
3 *Haya comido*,
1 *Hayamos comido*,
2 *Háyais comido*,
3 *Hayan comido*,

Pluperfect.

1 *Hubiera, habría, hubiese comido*, I would, should, might have eaten.
2 *Hubieras, habrías, hubieses comido*,
3 *Hubiera, habría, hubiese comido*,
1 *Hubiéramos, habríamos, hubiésemos comido*,
2 *Hubiérais, habríais, hubieseis comido*,
3 *Hubieran, habrían, hubiesen comido*,

Firet Future.

1 *Si comiere*, if I should eat.
2 *Si comieres*,
3 *Si comiere*,
1 *Si comiéremos*,
2 *Si comiéreis*,
3 *Si comieren*,

Second Future.

1 *Si hubiere comido*, If I should have eaten.
2 *Si hubieres comido*,
3 *Si hubiere comido*,
1 *Si hubiéremos comido*,
2 *Si hubiéreis comido*,
3 *Si hubieren comido*,

3rd Conjugation.

Present.

1 *Viva*, I may live.
2 *Vivas*,
3 *Viva*,
1 *Vivamos*,
2 *Vivais*,
3 *Vivan*,

Imperfect.

1 *Viviera, viviría, viviese*, I would, should, might live.
2 *Vivieras, vivirías, vivieses*,
3 *Viviera, viviría, viviese*,
1 *Viviéramos, viviríamos, viviésemos*,
2 *Viviérais, viviríais, vivieseis*,
3 *Vivieran, vivirían, viviesen*,

Perfect Indefinite.

1 *Haya vivido*, I may have lived.
2 *Hayas vivido*,
3 *Haya vivido*,
1 *Hayamos vivido*,
2 *Hayais vivido*,
3 *Hayan vivido*,

Pluperfect.

1 *Hubiera, habría, hubiese vivido*, I would, should, might have lived.
2 *Hubieras, habrías, hubieses vivido*,
3 *Hubiera, habría, hubiese vivido*,
1 *Hubiéramos, habríamos, hubiésemos vivido*,
2 *Hubiérais, habríais, hubieseis vivido*,
3 *Hubieran, habrían, hubiesen vivido*,

First Future.

1 *Si viviere*, if I should live.
2 *Si vivieres*,
3 *Si viviere*,

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1 *Si viviéremos,*
2 *Si viviéreis,*
3 *Si vivieren,*

2 *Si hubieres vivido,*
3 *Si hubiere vivido,*
1 *Si hubiéremos vivido,*
2 *Si hubiéreis vivido,*
3 *Si hubieren vivido,*

Second Future.

1 *Si hubiere vivido*, if I should have lived.

Remark.—The exercises in this lesson are designed for practice in the conjugations of regular verbs of the three terminations, *ar*, *er*, and *ir*. Of course all verbs whose present infinitive ends with *ar*, are of the first conjugation, and are to be conjugated like *amar*; those ending with *er* are of the second, and to be conjugated like *comer*; and those ending with *ir* of the third, and to be conjugated like *vivir*.

Vocabulary.

Hablar, to speak.
Buscar, to seek.
Quedar, to remain.
Llevar, to carry.
Rehusar, to refuse.
Comer, to eat, to dine.
Leer, to read.
Vivir, to live.
Cumplir, to fulfil.
Terminar, to terminate, to close.
Reposo, repose.
Correo, post, mail.
Deber, duty.
Mañana, to-morrow, morning.
Cuando, when.
A' las dos, at two o'clock.
Amar, to love.
Hallar, to find.
Llorar, to weep.
Viajar, to travel.
Llegar, to arrive.
Beber, to drink.
Responder, to reply, to answer.
Escribir,* to write.
Permitir, to permit.
Asunto, business, matter.
Palabra, word.
España, Spain.
Favor, favour.
Hasta entónces, till then.
Ya, already.
A' las tres, at three o'clock.
Los Estados Unidos, the United States.

Model Sentences.

El Señor nos ama, the Lord loves us.
No hemos bebido vino, we have not drunk any wine.
¿Me permitirá V. escribir dos cartas? will you permit me to write two letters?
Cumplid vuestros deberes, fulfil ye your duties.
Hable V. alto, speak aloud.
Viva, vmd., señora, muchos años, may you live, madam, many years.

Spanish-English.

Dios nos ama. Los pintores la aman. Mi madre busca reposo. Ella no halla reposo. El Aleman ama la verdad. Hablan. Hablas. Lloran. Quedan contentos. Vmd. busca reposo. ¿Hablan vms. Español? Hablamos Español. Quedas triste. Habláis el Ingles. No hallo reposo. Bebes vino. Bebo água. El Frances no come pan. Mis hermanos no baben vino. Como pan. Juan lee libros. Leen libros. No come V. nada. No beben vms. nada. ¿No respondes nada? Bebemos vino. Bebéis água. El medico viva en Lóndres. Mis hijas viven en los Estados Unidos. María escribe cartas. Escribís muchas cartas. Cumples tu palabra. Cumplo mis deberes. Vmd. vive en la ciudad. ¿Cómo halla V. este pan?

Llevábamos mucho dinero con nosotros. María lloraba. Pedro hablaba. Las mugeres lloraban. Las señoras buscaban reposo. Yo lloraba. Yo bahia vino. Diego bebia água. Comíamos pan. Vivían en Lóndres. Vivíais en la ciudad. Yo escribia una carta. Vivíais en Madrid. Escribíamos cartas. Yo buscaba reposo.

La Francesa no halló reposo. Viajó por España. Viajé por los Estados Unidos. Viajamos por Inglaterra. Hallaron un tesoro en el camino. Juan lloró. Leí estos libros. Comió pan y manteca. Comieron azucar. Bebimos vino y leche. Escribí dos cartas. Escribieron doce cartas. Juan no respondió nada. Vmd. vivió en Madrid.

Le han rehusado ese favor. Juan me ha rehusado ese favor. He hallado mis tesoros. ¿Ha llegado el correo? Hemos hallado las cucharas. ¿Has viajado por España? ¿Le habéis rehusado ese favor? ¿No ha comido V. pan? Ha comido mucho pan. Ha cumplido mi palabra. Han cumplido su palabra. ¿Ha llegado al juez? ¿Han hallado vms. mis lámparas? ¿Has comido mucha miel? ¿Ha viajado V. por los Estados Unidos?

Hasta entónces habíais hablado Español. Hasta entónces no hablamos terminado nuestros asuntos. Ya habian comido cuando llegamos. ¿No habías vivido ya en Lóndres? Hasta entónces habian vivido en paz.

Cuando hube hallado el tesoro, escribí cartas á mis amigos. Cuando hubiste comido, tu padre llegó. Cuando hubimos hablado, nuestras hermanas lloraron.

Viajaré por España. Vijaremos por Inglaterra. Hallará un tesoro. Comeré este pan. Comerán manzanas. Leerás esos libros. Cumpliremos nuestras palabras. Escribirán cartas. Mi criado llevará las cartas al correo. Habré comido á las dos. Habrán llegado á las tres. El correo habrá llegado á las dos.

Llorad con los que lloran. Comed este pan. Cumplid vuestras palabras. Bebed água. Vivid en paz con todos los hombres. Habla alto. Llora tú con los que lloran. Come tú conmigo. Come tú con Pedro. Cumple tus deberes. Habla Juan alto. Léa María mis cartas. Lean las señoras esos libros. Cumplan los hombres sus deberes. Léa vm. esa carta. Hable vmd. Español. Coma V. manzanas y peras. Lean vms. esa carta. No habla V. de eso. No léa vmd. ese libro. No bebas vino. No lloréis. Respondedme. Escribidles. Escribenos.

Es posible que halles un tesoro. Es posible que lean esos libros. Es probable que no cumplan sus deberes. Probable es que ella no la responda. ¡Ojalá halléis reposo!

Si yo hallase libros, yo los leería. Si María llorara, Juan lloraría. ¡Ojalá no bebiesen vino! ¡Ojalá no llorase! ¡Ojalá los hombres cumpliesen sus deberes! Preciso era que María no hablase alto.

¿Es posible que no hayan hallado un tesoro? Es posible que no haya llegado. ¡Ojalá yo no hubiese hablado! Era estraño que no hubiesen hallado esos libros. Si Juan no hubiese hablado María no habría llorado. Si mañana llegare Pedro, te escribiré. Si mañana hallaren un tesoro, nos escribirán. Si Diego no hubiere llegado mañana á las tres, le escribiremos una carta.

Permitama V. leer eso libro. ¿Me permitirá V. leer esa carta? Era preciso hablarles. Juan pretende no haber hablado. Estaban comiendo y bebiendo. Habiendo hallado un libro, la leí. Hablendo hallado un tesoro en el camino, le llevamos en la casa del abogado.

English-Spanish.

I-weep. God loves us. The painters love her. My mother seeks repose. She find not rapose. The German loves the truth. They speak. Thou speakest. They weep. They remain contented. You (*vmd.*) seek repose. Do you (*vms.*) speak Spanish? We speak Spanish. Thou remainest sad. Ye speak the English. I do not find repose. Thou drinkest wine. I drink water. The Frenchman does not eat bread. My brothers do not drink wine. I eat bread. John reads books. They read books. You (*vmd.*) eat nothing. You (*vms.*) drink nothing. Repliest-thou nothing? We drink wine. Ye drink water. The physician lives in London. My daughters live in the United States. Mary writes letters. Ye write many letters. Thou fulfillest thy word. I fulfil my duties. You (*vmd.*) live in the city. How do you (*V.*) find this bread?

We-were-carrying much money with us. Mary was-weeping. Peter was-speaking. The women were-weeping. The ladies were-seeking repose. I was-weeping. I was-drinking wine. James was-drinking water. We were-eating bread. They were-living in London. Ya were-living in the city. I was-writing a latter. Thou wast-living in Madrid. We were-writing letters.

The French-woman found (perf. def.) no repose. He travelled through Spain (*España*). I travelled through the United States. We travelled through England. They found a treasure in the road. John wept. I read these books I-ate bread and butter. They ate sugar. We drank wine and milk. I wrote two letters. They wrote twelve letters. John answered nothing. You (*vmd.*) lived in Madrid.

* *Escribir* is irregular in its past participle, having *escrito* and not *escribido*.

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They have refused him that favour. John has refused me that favour. I have found my treasures. Has the[2] post[2] arrived[1]? We have found the spoons. Hast-thou travelled through Spain? Have-ye refused them that favour? Have you (*vmd.*) not eaten bread? I have eaten much bread. I have kept (*cumplido*) my word. They have fulfilled their word. Has the[2] judge[3] arrived[1]? Have you[2] (*vms.*) found[1] my lamps? Hast thou eaten much honey? Have you[2] (*vmd.*) travelled[1] through the United States?

Till then ye-had spoken Spanish. Till then we-had not terminated our business (plur.). They-had[2] already[1] eaten[3] when we arrived. Hadst-thou not already[2] lived[1] in London? Till then they had lived in peace.

When I-had found the treasure, I wrote letters to my friends. When thou-hadst dined, thy father arrived. When we-had spoken, our sisters wept.

I-shall travel through Spain. We-shall-travel through England. He-will find a treasure. I-shall-eat bread. They-will-eat apples. Thou-wilt-read those books. We-shall-fulfil our words. They-will-write letters. My male-servant will-carry the letters to the post. I-shall-have dined at two o'clock. They-will-have arrived at three o'clock. The post will-have-arrived at two o'clock.

Weep-ye with those who weep. Eat-ye this bread. Fulfil-ye your promises (*palabras*). Drink-ye water. Live-ye in peace with all men. Speak-thou loud (*alto*). Weep thou with those who weep. Eat thou with me. Eat thou with Peter. Fulfil thy duties. Let John speak loud. Let Mary read my letters. Let the ladies read those books. Let men fulfil their duties. Read (*vmd.*) this letter. Speak Spanish (let your-worship speak Spanish). Eat (*vmd.*) some apples and pears. Read (*vms.*) that letter. Do not speak of this. Do not read this book. Do not drink (sing.) wine. Weep-ye not. Answer-ye me. Write-ye to them. Write-thou to us.

It-is possible that thou-mayest-find a treasure. It-is possible that they-may-read those books. It-is probable that they-may not fulfil their duties. It-is probable that she may not answer him. O-that ye-may-find repose!

If I should-find books, I would-read them. If Mary should-weep, John would-weep. O-that they-would not drink wine! O-that he would not weep! O-that men would-fulfil their duties! It-was (*era*) necessary that Mary should not speak loud (*alto*).

Is-it possible that they have not found a treasure? It-is possible that he-may not have arrived. O-that I had not (might not have) spoken! It-was (*era*) strange that they-should not have found those books. If John had not (should not have) spoken, Mary would not have wept. If Peter[3] should-arrive[2] to-morrow,[1] I-will-write to-thee. If they (shall) find[2] a[3] treasure[4] to-morrow,[1] they-will-write to-us. If James has not (say, shall not have) arrived to-morrow at three o'clock, we will write him a letter.

Permit me to-read that book. Will you (*vmd.*) permit me to read that letter? It-was necessary to-speak to-them. John pretends not to-have spoken. They-were (*estaban*) eating and drinking. Having found a book, I am reading it.

Remark.—In order to become thoroughly familiar with the conjugation of the regular verbs, the student should write and re-write all the persons of the various moods and tenses (as before directed), until he finds himself able to write them without referring to the model verbs. He must be careful to remember the changes in orthography sometimes required.

The following verbs, together with those already given in the vocabulary of this lesson, will serve as examples for practice:—

Pagar, to pay.	*Tomar*, to take.
Llamar, to call.	*Ornar*, to adorn.
Comprar, to buy.	*Juzgar*, to judge.
Pender, to hang.	*Creer*, to believe.
Temer, to fear.	*Escoger*, to choose.
Aprender, to learn.	*Vencer*, to conquer.
Unir, to unite.	*Sufrir*, to suffer.
Abrir, to open.	*Añadir*, to add.
Asistir, to assist.	*Admitir*, to admit.

FRENCH READINGS.—No. XXXIV.

EUDOXIE.

Section IV.

Les informations sur le général furent faciles à[a] prendre. Quand M. Offenheim fut tout à fait en règle[b] de ce côté, il appela Eudoxie et lui révéla le grand secret.[1]—Si vous ne vous sentez pas d'éloignement pour le général, mon enfant,[2] c'est une chose faite.

—Ah! Monsieur....mon bon oncle, mon père.[4] C'est tout ce que put[c], articuler Eudoxie.

Puis, après un moment de silence, elle ajouta: Mais tant de gloire et de bonheur ne vaut[d] pas le douceur de rester près de vous;[5] je ne puis rompre cette habitude de mon cœur il m'est impossible de vous quitter,[6] même pour une félicité dont je sens tout le prix.

—Mon enfant, reprit le vieillard, votre piété filiale et ingénieuse, a instruit ceux qui m'entourent, de tous les soins que demande ma pauvre existence.[7] Vous avez de bons élèves ici, je vous assure,[8] je m'en contenterai fort bien. Et d'ailleurs, si je voulais ce mariage, si je vous l'ordonnais[9]....

—Je vous désobéirais, mon père![10] répliqua Eudoxie. Oui....et ne vous fâchez[e] pas. Quand ma bonne tante fut près de mourir,[11] elle nous fit jurer, à ma sœur et à moi, en nous léguant nos dots, de ne nous marier qu'à la condition de ne pas vous quitter.[12] Ce serment, qui était d'avance écrit dans mon cœur fut bien vite sur mes lèvres.[13] Vous ne voudriez pas me rendre parjure et malheureuse.

—Eh bien! reprit encore M. Offenheim, vous vous marierez et vous ne me quitterez pas.[14] Je vous suivrai en France; dans votre ménage Qu'avez vous à dire maintenant?

Le contrat de mariage fut signé le même jour que le paix.[15]

Eudoxie écrivit à Thécla une lettre où tout son cœur s'épanchait.[16] Thécla répondit par un mot assez[f] spirituel;[17] et, après plusieurs mariages manqués, elle se fit chanoinesse, pour être au moins appelée *Madame*.[18]

Le bonheur d'Eudoxie duré encore et s'est accru[g] d'année en année, à travers bien des révolutions. Cela prouve que la vertu a sa récompense sur la terre....quelquefois![19]

EMILE DESCHAMPS.

Colloquial Exercise.

1. Était-il facile de prendre des informations sur le général?
2. Que fit M. Offenheim quand il fut satisfait du résultat de ses informations?
3. Que lui dit-il?
4. Que répondit la jeune fille?
5. Qu'ajouta-t-elle après un moment de silence?
6. Que dit-elle encore?
7. Que répondit l'excellent vieillard?
8. Que dit-il à l'égard des élèves d'Eudoxie?
9. Que dit-il du mariage?
10. Quelle fut la réponse de la jeune fille?
11. Que dit-elle de sa tante?
12. Qu'avait fait promettre aux jeunes filles, Mme Offenheim?
13. Que dit Eudoxie à l'égard du serment?
14. Que répondit l'oncle?
15. Que se passa-t-il le même jour?
16. Que fit alors Eudoxie?
17. Comment Thécla répondit-elle?
18. Que fit enfin Thécla?
19. Que prouve tout cela?

Notes and References.—*a.* prendre, *make*—*b.* en règle, *satisfied*.—*c.* from *pouvoir*; L. part ii., p. 98.—*d.* ne vaut pas, *is not equal to*; from *valoir*; L. part ii., p 108.—*e.* L. S. 39, R. 4—*f.* spirituel, *witty*.—*g.* from *accroître*; L. part ii., p 76.

LE VAISSEAU EN PE'RIL.

Un vaisseau tourmenté par de longs ouragans,
Contre les aquilons et les flots mugissants,
Luttait sur une mer d'écueils environnée ;[1]
Et plus fatale encore que les flots et les vents,
La discorde en son sein[a] rugissait déchaînée.[2]
Son équipage mutiné
Ne reconnaissait plus la voix du capitaine.[3]
Il ne pouvait régler la manœuvre incertaine
Du malheureux navire aux vents abandonné,[4]
Matelots, mousses et novices,
Tous veulent commander ; nul ne veut obéir ;[5]
Chacun a son avis,[b] son orgueil, ses caprices.[6]
C'est un tapage à ne plus rien ouïr ;
Et le vaisseau, dont l'ouragan se joue,[7]
Au sud, au nord, au couchant, au levant,
Présentant tour à tour et la poupe et la proue,
Va tantôt en arrière et tantôt en avant.[8]

De ce désordre innocentes victimes,
Les passagers en vain criaient aux disputeurs ;[9]
—Manœuvrez, sauvez-nous, suspendez vos fureurs,
Ou cette mer terrible, en ses profonds abîmes,[10]
Mettra bientôt d'accord[c] et vaincus et vainqueurs.
D'une frayeur trop juste, inutile requête ![11]
Livré sans gouvernail au choc des éléments,
Sur la pointe d'un roc le navire se jette,[12]
Et d'effroyables craquements,[13]
Répondent aux mugissements
Des vagues et de la tempête,
Ce malheur éteint-il[d] la rage des partis ?
Non, non ; de leur ruine, ils s'accusent l'un l'autre ;[14]
La dispute redouble ; on n'entend que ces cris :
—C'est ta faute.—Non, c'est la vôtre.[15]
—C'est vous.—C'est toi qui nous perdis.[e]
—C'est la faute de tous,[16] répond le capitaine,
Dont la voix, libre enfin, domine les clameurs.
C'est votre vanité qui fit tous vos malheurs.[17]
De vos divisions vous subissez la peine.
Un dernier craquement retentit à ces mots ;[18]
Le pont[f] s'était ouvert sous la vague en furie,
Un dernier cri s'élève, et l'abîme des flots
Se referme en grondant sur la nef engloutie.[19]

Je ne sais point sous quels climats
Ni sous quel nom navigunit ce navire ;[20]
Mais, vous qui me lisez,[g] vous pourriez me le dire
Et, si vous m'en croyez, vous ne l'oublierez pas.[21]

VIENNET.

Colloquial Exercise.

1. Où le vaisseau était-il exposé à la tempête ?
2. Que se passait-il dans ce vaisseau ?
3. Que faisait alors l'équipage ?
4. Que ne pouvait régler le capitaine ?
5. Que voulaient les matelots et les mousses ?
6. Etaient-ils d'avis différents ?
7. Que devenait le vaisseau pendant la dispute ?
8. Comment allait-il ?
9. Que faisaient les pauvres passagers ?
10. Que disaient-ils du sort qui les attendait ?
11. Fit-on attention à la demande des passagers ?
12. Que devint le navire pendant le désordre ?
13. Qu'est-ce qui répond aux mugissements des vagues et de la tempête ?
14. Cet accident éteignit-il la rage de l'équipage ?
15. Que se dit l'équipage ?
16. Que répondit alors le capitaine ?
17. Que dit-il de la vanité de ses gens ?
18. Qu'arriva-t-il à ces mots ?
19. Que devint le malheureux vaisseau ?
20. Que dit le poète en conclusion ?
21. Quel avis donne-t-il a ses lecteurs ?

Notes and References.—*a* la discorde en son sein, *internal discord.*—*b.* avis, *opinion.*—*c.* mettra bientôt d'accord et vainqueurs et vaincus, *will soon reconcile conquerors and conquered.*—*d.* from *éteindre* ; L. part ii., p. 90.—*e.* L. S. 80, R. 2.—*f* pont, *deck.*—*g.* from *lire* ; L. part ii., p. 94.

CHRONOLOGY.—No. VII.

A.D.
673.—The Saracens' fleet before Constantinople burnt by the use of the famous Greek fire.
677.—The Saracens raise the siege of Constantinople, and pay tribute to the Greek Emperor.
687.—Pepin d'Heristal becomes the most powerful man in France.
697.—The Republic of Venice founded.
707.—The Saracens seize on some portions of Iudia.
709.—They conquer Africa.
711.—Advance into Spain.
714.—Death of Pepin of France; Charles Martel, Mayor of the Palace, ascends the throne.
717.—Unsuccessful siege of Constantinople by the Saracens.
743.—First German synod held.
752.—Pepin, King of France, founder of the Carlovingian dynasty ; first to call himself King by the grace of God.
771.—Charlemagne sole King of France.
774.—The Lombards finally defeated in Italy by Charlemagne.
777.—Charlemagne successful over the Saxons.
778.—The Saracens defeated by Charlemagne.
791.—University of Paris founded.
800.—Charlemagne crowned King of the West.
802.—Haroun al Rashid, Khalif of Bagdad, concedes to Charlemagne the site of the Crucifixion and of the Holy Sepulchre at Jerusalem.
814.—Death of Charlemagne.
827.—Egbert, King of Wessex, unites the Saxon Heptarchy, and becomes sole King of England.
832.—The Danes begin to ravage the coasts of England.
840.—Rise of the Russian monarchies under Russia.
849.—Alfred the Great born.
853.—The Normans seize upon several cities in France.
863.—The kingdom of Denmark founded by the union of Jutland and the Danish isles.
871.—Accession of Alfred the Great as King of England.
878.—Defeat of the Danes.
886.—The University of Oxford founded.
890.—Migration of the Magyars into Hungary.
901.—Death of Alfred the Great.
911.—Rollo made Duke of Normandy.
915.—University of Cambridge founded.
936.—Otho the Great, Emperor of Germany.
955.—The Russians adopt Greek Christianity.
962.—Otho crowned King of Italy and Emperor of the West.
967.—Defeat of the Saracens in the West by Otho.
980.—Vladimir made Grand Duke of Russia.
995.—The Arabic figures now used in arithmetic brought into Europe by the Saracens.
996.—The Empire of Germany declared elective.
999.—Boleslaus first King of Poland.
1000.—Stephen first hereditary King of Hungary.
1016.—Canute the Dane sole King of England.
1018.—Poland invaded by the Russians.
1019.—Canute completes the conquest of Norway.
1027.—Sweden conquered by Canute.
1043.—Constantinople attacked by the Russians.
1050.—The Greek Empire invaded by the Turks.
1065.—Jerusalem captured by the Turks
1066.—William, Duke of Normandy, invades England, and becomes king, under the surname of the Conqueror.
1078.—Doomsday Book began to be compiled, by order of William the Conqueror.
1080.—The Tower of London built.
1096.—The First Crusade against the Turks in Palestine incited by the monk called Peter the Hermit.
1118.—The order of the Knights Templars instituted.
1147.—The Second Crusade undertaken at the persuasion of St. Bernard.
1154.—Brookspeare, an Englishman, made Pope.
1160.—Peter Waldo founded the sect known as the Waldenses.
1172.—Conquest of Ireland by Henry II.
1188.—Siege of Acre by the Crusaders.
1189.—Richard, the Lion-heart, King of England.
1192.—Saladin defeated by Richard at the Battle of Ascalon.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXVIII.

(*Continued from page 227.*)

ELECTRO-MAGNETISM.

While the investigations mentioned in our last lesson were going on in America, Professor Moll, of Utrecht, made some experiments with one of Mr. Sturgeon's electro-magnets, which he procured from Mr. Watkins of London, the object of which was, to try the mechanical effect of using powerful single batteries. With a battery presenting a zinc surface of 11 square feet, the magnet lifted 75 pounds; but a battary of 17 feet, and also one of very great size, gave no increase of magnetic power.

He then sought to produce greater effects by using a horse-shoe 12½ inches high and 2½ inches in diameter, which lifted 154 pounds with the same battery. But that he had no idea of the effect of increasing the number of spires of the magnetising helix, is evident from the fact that he wound the latter magnet with only 44 turns of uncovered wire, while the number of similar spires on the smaller magnets was 83, or nearly twice as many.

Professor Moll, however, particularly observed the instantaneous destruction and reproduction of magnetism, which takes place when the current is reversed, by changing the connection of each end of the helix from one pole of the battery to the other. This prompt action of the magnet is essential to the usefulness of the electro-magnetic telegraph, and on that account the same fact has since been investigated by other philosophers.

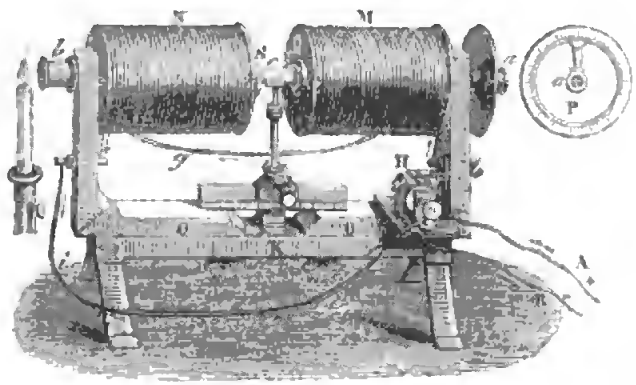
As the claims of Professor Moll have been asserted to the prejudice of Professor Henry's, it may here be remarked, that the former employed one of Mr. Sturgeon's magnets, purchased of Mr. Watkins, and only thought of increasing the size of the horse-shoe, when he failed to obtain any greater development of magnetism by using much larger and more powerful batteries. Professor Henry, on the contrary, thoroughly investigated the effects of varying the quantity and intensity of the battery-current, the size and form of the horse-shoe, the number of spires of the helix, and the resistance of the conducting-wires. The experiments of Professor Moll were very incomplete; and though they were published shortly before the researches of Professor Henry, yet the latter had discovered in 1828, and exhibited to the Albany Institute in 1829 (two years previously), the fact that the current of a small galvanic element passed through a wire covered with silk, and wound 400 times round a horse-shoe of soft iron, rendered it more powerfully magnetic than a similar horse-shoe wrapped loosely with a few turns of an uncovered wire, and excited by a battery of 28 plates of copper and zinc, each eight inches square.

Having fully investigated the phenomena of electro-magnetic induction, Professor Henry was enabled to make soft iron magnets of wonderful power. One, in the cabinet of Yale College, weighing 59½ pounds (exclusive of the copper wire round it), was formed of a bar of iron 3 inches square and 30 inches long. It was wound with 26 strands of copper bell-wire covered with cotton-thread, and 31 feet long. About 18 inches of the ends were left projecting, so that only 28 feet actually surrounded the iron; the aggregate length of the coils was, therefore, 728 feet. Each strand was wound on a little less than an inch; in the middle of the horse-shoe the wire formed three thicknesses, and on the ends, or near the poles, it was wound so as to form six thicknesses. This magnet supported 2,063 pounds, or nearly a ton, with a battery exposing a zinc surface of nearly five square feet. The effect of a larger battery was not then tried.

Another, and the largest of these magnets, constructed by Professor Henry, is in the cabinet of the College of New Jersey, and the following is his description of it:—It is formed of a bar of rounded iron, nearly four inches in diameter, weighing about 100 pounds, and surrounded with 30 strands of copper bell-wire, each about 40 feet long. With a calorimeter on Dr. Hare's plan, consisting of 22 plates of zinc, each 9 inches by 12, alternating with plates of copper of the same size, it supports 3,500 pounds, or more than a ton and a half.

After the connection with the battery is broken, this magnet supports a thousand pounds for several minutes; and from year to year the lifter adheres with a force which is overcome only by a weight of several hundred pounds. When the lifter, however, is detached, nearly all the magnetism disappears.

Fig. 158.



It is evident that, by increasing the size of the iron bar, the number of the coils, and the power of the battery, the magnetic power may be almost indefinitely extended.

That a force of such great intensity may be applied to the production of mechanical effects, is an idea which would naturally arise in any mind; and that Professor Henry should, therefore, have been the first to attempt such an application, is almost a consequence of his previous researches. In an American periodical for 1831, he described a machine for producing a reciprocating motion "by a power never before applied in mechanics—by magnetic attraction and repulsion." Of which he remarks: "Not much importance, however, is attached to the invention, since the article, in its present state, can only be considered a philosophical toy; although, in the progress of discovery and invention, it is not impossible that the same principle, or some modification of it on a more extended scale, may hereafter be applied to some useful purpose."

The next person who contrived a modification of the above-described electro-magnetic machine, was Professor Ritchie, of the London University, who published an account of it, in 1833, in the "Transactions of the Royal Society."

In 1834, Mr. Davenport, an ingenious blacksmith of the American State of Vermont, having seen a powerful electro-magnet, contrived a machine upon the same principle, which

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was exhibited in the principal cities of the United States, but resulted in no useful or valuable application, though an attempt was made to drive a printing-press with it.

Of more recent attempts to apply this power, we may mention one made on the Edinburgh and Glasgow Railway, by Mr. Davidson, who constructed an electro-magnetic locomotive, 16 feet long, 6 feet broad, and weighing 6 tons; and another, by Professor Jacobi, of St. Petersburg, at the expense of the Russian government. That of Mr. Davidson failed to propel the engine alone more rapidly than 4 miles an hour; but Professor Jacobi propelled a boat 28 feet by 7½ feet, drawing 2¾ feet of water, at the rate of three miles an hour against the stream, with a party of about a dozen persons on board.

It is evidently possible, when we possess a source of mechanical power, to accumulate it, either by employing one very large engine, or a number of smaller ones. The question whether electro-magnetic forces can be rendered practically useful, depends not, therefore, so much upon the amount of power required, as upon considerations of economy. Water and fuel are found everywhere in nature in the greatest abundance, while zinc and acids are manufactured articles of comparatively high cost. An engine which consumes such substances in large quantity cannot, therefore, be employed with profit in competition with steam. And this conclusion, based upon theoretical reasons, is fully confirmed by experiments with such machines.

It should also be borne in mind, in estimating the effective working-power of an electro-magnetic engine, that the forces vary inversely as the square of the distance; and that, therefore, though a magnet, such as those of Professor Henry, sets with a *cohesive* attraction of more than a ton *in contact*, or at infinitely small distances, it exerts, when the contact is broken, or at appreciable distances, a force of only a few pounds.

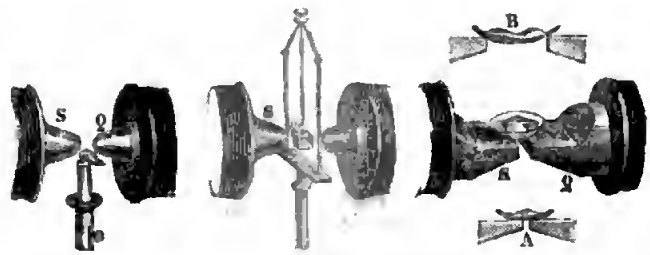
The fact mentioned above, that the armature or lifter of a large electro-magnet adheres with a force of several hundred pounds from year to year, after connection with the battery is broken or the magnetising cause has ceased to act, shows that there is nothing improbable in the hypothesis of Ampère, that electrical currents circulate constantly round the axes of the magnetic molecules. And, indeed, the planetary motions, as well as correct mechanical ideas, have fully established the truth, that a state of motion, in the absence of resistance, will continue indefinitely. In the present state of our knowledge of the constitution of matter, we have reason to believe that no two atoms can possibly be brought into absolute contact; and that an athereal fluid, such as electricity may be supposed to be, may revolve perpetually in their intervening spaces, is therefore neither an improbable hypothesis, nor without analogy in nature.

Optical Effects of powerful Electro-magnets.—Professor Faraday, in 1845, discovered that a powerful electro-magnet exercises such an influence upon several transparent substances, that if a polarised ray passes through them in the direction of the line of the magnetic poles, the plane of polarisation is deflected to the right or the left, according to the direction of the magnetisation.

The apparatus of Professor Faraday is represented in fig. 455. It is formed of two extremely powerful electro-magnets, N and S, attached to two iron slides, O and O', which are capable of being brought near each other by sliding on a support, K. The current of a Bunsen battery, with ten or eleven couples, enters at A, passes along to a cylinder, H, and thence to the bobbins, M, whence it goes along the wire *g* to K, descends along the wire *f*, again reaches the cylinder H, and goes out at B. The two soft iron cylinders, S and Q, which form the axes of the bobbins, are pierced with cylindrical apertures, to allow the luminous rays to pass through. Lastly, at *b* and *a* are two Nicol prisms, the former serving as polariser, the latter as analyser. The latter is made to revolve at the centre of a graduated circle, P.

These two prisms being arranged in such a manner that their principal sections may be perpendicular to each other, the prism *a* completely extinguishes the light passed through the prism *b*. If you then put a piece of flint or glass with parallel surfaces at *c* on the axis of the two bobbins, the light is still extinguished as long as the current does not pass; but directly the communications are established, the light reappears, but coloured, and if the analyser *a* is turned to the right or the left, according to the direction of the current, the light exhibits the various colours of the spectrum, as is the case with plates of quartz cut perpendicularly to the axis. M. E. Becquerel has shown that a great number of solid and liquid substances are thus capable of deflecting the plane of polarisation under the influence of powerful magnets. Mr. Faraday considers that, in these experiments, the rotation of the plane of polarisation is owing to an action of the magnets upon the luminous rays. Messrs. Birt and E. Becquerel think the phenomenon is owing to an action of the magnets upon the transparent bodies brought under their influence—an hypothesis generally admitted.

Fig. 456. Fig. 457. Fig. 458.



Effects of Diamagnetism produced by powerful Electro-Magnets.—Professor Faraday's apparatus serves also to exhibit other very remarkable effects of powerful magnets. We will describe a few experiments which require soft iron armatures, S and Q, of various forms (figs. 456, 457, 458) to be screwed on to the bobbins.

1. M. Bancalari first observed that on placing the flame of a candle between the two magnets, it is repelled, fig. 456. Professor Faraday having found that oxygen, which is magnetic at an ordinary temperature, becomes diamagnetic at the temperature of flame, the repulsion thus exhibited may be explained by the mere repulsion to which the air is subjected; an explanation analogous to that given of the repulsion of flame by electrical machines.

2. If a small cube of red copper be hung between two magnets by a twisted silk thread, fig. 457, and be allowed to revolve rapidly by untwisting itself, it will stop directly the current passes through the bobbins, and remain fixed in its position. If instead of a cube a small rectangular bar is substituted, it will come into a position at right angles with the axis of the bobbins, or in a line with it, according as it is made of a diamagnetic substance, as bismuth and antimony, or a magnetic substance, as iron, nickel, or cobalt. Professor Faraday, who first observed these phenomena, attributes them to currents of induction which are developed in bodies by the influence of magnets.

3. M. Plücker, having placed a solution of chlorids of iron in a watch-glass, fig. 458, observed that, according to the distance of the bobbins, the solution formed one or two swellings, as represented at A and B. The curvature of the liquid in this case evidently depends upon the magnetic action of the bobbins combined with that of gravity.

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LESSONS IN GEOLOGY.—No. LX.

By Thos. W. Jenkyn, D.D., F.G.S., F.R.G.S., &c.

CHAPTER V.

ON THE CLASSIFICATION OF ROCKS.

SECTION XI. (*continued.*)

ON THE COAL MEASURES.

§ III. GEOLOGICAL PHENOMENA OF THE COAL PERIOD.

You have already been told that the carboniferous strata or coal-bearing rocks consist of sandstones; clays, containing iron, and hence called iron-stone; a slaty clay called shale; beds of grit, limestone, and coal seams.

The number of these beds varies in different coal-fields, but the thickness of the entire series is almost invariably very great. In Durham and Northumberland the coal strata altogether form a mass of more than four thousand feet in depth, *i. e.* about three-quarters of a mile in thickness. This deposit consists of the following number of beds:

32 Beds of coal seams with their corresponding shales.
62 Beds of sandstone.
17 Beds of limestone towards the bottom.

The enumeration of the strata may be different in the coal-fields of Staffordshire, of South Wales, etc., but this specimen of the lithological structure and geological order of the series, is sufficient to indicate that the various beds must have been formed under different geological influences and agencies, which I will endeavour to explain.

I. THE VEGETABLE ORIGIN OF COAL.

The vegetable origin of coal is now almost universally admitted by all scientific geologists. The problem of its origin was rendered difficult by the fact that the vegetable matter, by bituminous fermentation and by the chemical and mechanical processes which converted it into a mineral, caused the original structure of the plants to be obliterated. Yet the evidences of its vegetable origin are not lost.

1. The experiments of Dr. Mc Culloch enabled him to trace successfully the gradual passage of vegetable matter from peat, brown coal, lignite and jet, to pitchy coal, anthracite, graphite, and plumbago or black-lead.

2. Professor Göppert, to demonstrate the vegetable origin of the impressions of leaves found in iron-stone, placed a common fern leaf in a lump of clay, which, after being dried, he exposed to red heat. When he broke this mass open, the inside presented an exact resemblance of fossil plants in iron-stone.

By frequent experiments he found that, according to the degree of heat in which such clay was placed, the plant became brown, or shining black; or the plant became entirely lost, in which case only the impression remained. The disappearance of the plant had caused the whole of the surrounding clay to be stained black—a fact which indicates that the black colour of the coal shales is derived from the carbon of the plants.

3. The microscope has satisfactorily revealed in chips or slices of coal, duly prepared, traces of the fibrous tissue and woody structure of the plants. In the same manner traces of the spiral vessels and the cells of plants are found in the white ashes after the coal has been burnt.

Sometimes the mineral coal appears to be entirely composed of very small leaves, bruised and decayed, but all matted together.

II. THE DEPOSITION OF THE COAL SEAMS.

Though all naturalists admit the vegetable origin of coal, the manner in which that vegetable matter was deposited is a question of considerable dispute among geologists. From the various circumstances in which the coal fields are found, some geologists have thought that the present coal seams were at first mere peat bogs, and that their different layers were produced by successive subsidence and elevation of the land. A second class have thought that groves and forests were swept away by floods and inundations, and were thus drifted out to the ocean, where they were engulphed and became decomposed; while a third class think that the coal plants have grown and have been imbedded on the spot where the coal seams are now found.

It is possible that coal may have been formed under each of these three circumstances, and that in some places each of these causes may have been in operation in producing a coal seam. Some of the coal deposits in Yorkshire have every appearance of having been formed at the bottom of fresh-water lakes, as the associated beds have fresh-water shells. Seams in the coal field to the south and west of Shrewsbury, seem formed in the bed of a river or estuary. Other seams were no doubt formed at the bottom of the ocean, for the associated grits and limestones contain marine shells.

On these theories, Sir Roderick Murchison makes the following remarks in his "Siluria," p. 279: "The supposition of many and successive subsidences of vast swampy jungles beneath the level of the waters, best explains how the different vegetable masses became covered by beds of sand and mud, so as to form the sandstone and shales of such coal fields. But this theory of oscillation, or of the subsidence *en masse* of ancient marshes, and their re-elevation, with occasional sand-drifts, though good in such examples as those of the South Wales and Newcastle coal fields in England, as also of the large coal fields in British North America,—can have little application to those other seams of coal, which are interstratified with beds containing marine shells, the animals of which, such as Producti and Spirifers, must have lived in comparatively deep sea-water. In such examples, and nearly all the older coal-beds come into the category, we may, on the contrary, endeavour to explain the facts by the supposition, that the ancient streams, like the present Mississippi and other large rivers, which flowed through groves or low lands and mud banks, transported great quantities of trees, leaves and roots entangled in earth, and deposited them at the bottom of adjacent estuaries, or that they were carried *en masse* into the broad, open sea."

Notwithstanding this high authority for the formation of coal on the theory of plants, groves, and forests being drifted by rivers into estuaries, lakes, or seas, the structure of the coal itself supplies us with many arguments to prove that the coal seams are the decomposed remains of plants and trees that grew and decayed upon the spot. All these arguments subvert the theory of its having been drifted, and shew that the instances in which plants and trees have been drifted, are nothing but the accidental results of the inundation by which the submersion of the forest was effected.

1. The Uniform Thickness of each Seam of Coal.—A seam of coal is of equal thickness, and without any inequality throughout the whole of its extent, for many miles wide and some scores of miles long. Over such areas, some of them hundreds of square miles, no stream, flood, or inundation would have formed a deposit of equal thickness everywhere. The only exceptions are the cases in which they thin out.

2. The Preservation of the Coal Plants.—The coal plants are found in the most perfect state of preservation, with their soft leaves, the delicate texture of ferns, and the sharp angles of stems, all well defined. These plants were once soft, and a little rolling would have crushed and disintegrated them; and yet all the lines, streaks, dottings and flutings of the Sigillaria, etc., are preserved in all their delicate textures. The fruits also of some of the coal plants are found in clusters and heaps. If these plants had been drifted, their structure would have been destroyed, and their fruits would have been dispersed by currents.

3. The Chemical Elements of Coal.—Coal consists of carbon combined with the gases hydrogen, oxygen, and nitrogen. These three gases are very volatile, and easily escape. If successive masses of vegetable matter were drifted and deposited by floods or tides, such an agency, by allowing the gases to escape during decomposition, would be inadequate to produce coal; for without the gases being detained, there would be no coal.

4. The Purity of the Coal.—With the exception of the chemical production called Iron Pyrites, every seam of coal is an unmixed mineral—without a pebble, without gravel, with-

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out sand. If the seams of coal had been formed by drifted wood, the current or flood that drifted the wood would have drifted also some gravel or sand. But of this there is not a vestige in mineral coal.

5. Trees standing Erect in the Coal Measures.—The instances are very numerous, in which the workings of the coal measures expose the stems, trunks and roots of trees, which seem to have grown on the identical banks of sand or mud where we now discover them, and whose decomposed leaves and associated plants formed the coal.

Imagine that you had a garden of about a quarter of an acre of ground. You remove the soil, several feet deep,—say for brick-making. As the earth is wheeled away, you find tree-trunk after tree-tronk exposed to view, standing some feet high, and with their roots fixed. Would you doubt that those trees grew there? would you infer that some flood placed them there all in an upright position? The evidence would be demonstrative that the trees grew on the spot. Precisely such a quarter of an acre is found at Parkfield, near Wolverhampton. The workmen cleared away all the rock that covered the coal, and then they found throughout that area seventy-two upright trees with their roots attached to the bottom soil. Some of these trees were more than eight feet in circumference. Some of the trunks were lying prostrate in different directions, for they had been broken off close to the root by some powerful agent. This was undoubtedly the remains of a submerged forest. But below this bed, there was another forest of the same character, and five feet below that there was a third forest with large stumps of trees.

These seams of coal, therefore, are the vegetable matter of decomposed plants and trees that grew on the spot. The spot was liable to be inundated from time to time, and was consequently raised higher and higher by the accumulation of sediments, as is now the case in jungles and swamps near large rivers like the Ganges or the Mississippi. As one growth of trees perished, and as the soil rose higher, other trees grew up from the new soil, now several feet higher above the level of the first morass, as is represented in our engraving of the coal measures at St. Etienne, fig. 20.

I might quote instances of a similar character from the coal works of Capel Coelbren, near Swansea, of Balgray, near Glasgow, and from a railway cutting, near Salford, on the Manchester and Bolton line; but one other, from Cape Breton, in Nova Scotia, will be sufficient. In the Sydney coal field of that country, Sir Charles Lyell saw erect trees occurring at different levels successively. In that section there are forty-one different beds of clay, with roots of Stigmaria in their natural position, and eighteen layers having upright trees at levels one above the other. The whole section, he says, furnishes clear evidence that at least fifty-one forests, now fossil, had grown and decayed on that spot, one after another.

III. THE PROGRESSIVE FORMATION OF THE COAL STRATA.

1. At the commencement of the coal epoch, or rather at the close of the age of the old red sandstone, much of the northern part of the globe appears to have been covered with the ocean. But now, in that ocean, a very great change took place as to its elementary constituents. Carbonate of lime seems to have predominated, and to have extended itself over much of its area from the arctic regions to the equator. The gradual diminution of the size of the pebbles, in the upper portions of the old red sandstone, implies that the alternation with fine submarine gravel was not very sudden.

There are, indeed, limestones, and those produced by corals, in the Silurian beds; but they bear no proportion, either in extent or in thickness, to the coralline limestones of the coal period.

The bottom rock, then, of the coal strata consists, in most countries, of solid compact limestone, the whole of which, in some places, is the production of the coral insect. This bed exists everywhere as a cover over the old red sandstone, except in Ireland, where it is either covered up by other rocks, or, most likely, replaced by the millstone grit.

The existence of this mountain limestone indicates that in our latitudes, at the time of its formation, there was a shallow sea, the bottom of which formed a fit foundation for coral reefs, such as we have now in the Pacific. On banks in this bottom the coral insects began to work, and as such banks belonged to a land that was gradually sinking, the insects continued to work upwards until they produced those enormous masses of limestone, which now form high mountains in both the Old and the New Worlds.

2. During the formation of this limestone in the seas that then covered England, there was, in what is now called the Atlantic, a large tract of land, extending from the north and south of England for some hundreds of miles westward to the ocean. In the meantime, the building up of such extensive coral reefs, and of such great thickness, would necessarily raise the level of the sea bottom. Nevertheless, the land is still supposed to be sinking.

3. After the land continued to sink gradually for some time, a change took place, when it began to rise again. In the course of its elevation, the limestone work of the corals became covered with a very extensive and thick bed of sandstone and grit, now called the Millstone Grit, consisting of the detritus, probably, of the large tract of land which we have supposed to be extending to the Atlantic.

4. The deposition of this grit was succeeded by the formation of muddy and sandy beds, on which a most luxuriant vegetation began to grow. These extensive beds appear to have been first formed, especially in South Wales, in water of a moderate depth, during a slow and perhaps intermittent subsidence of the ground, in a region to which rivers, from the supposed Atlantic land, would be bringing down a constant supply of sand and muddy sediment.

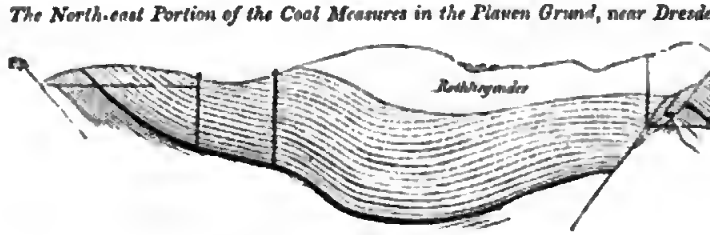
As these muddy beds rose above the waves, the whole area became covered with forests, such as we see now in the deltas of large American rivers in warm climates—deltas which are liable to be submerged beneath the sea, or covered by inundations of fresh water, should the district sink but a very few feet.

5. The peculiar character of this coal forest has been represented in one of our late engravings, fig. 17. This forest is depicted as growing in a broad sheet of water, or in a shallow lagoon, which received at intervals deposits of mud and silt, the detritus of neighbouring lands. Such lakes or sheets of water would be speedily filled up by a growth of profusion of plants and trees, until, by the accumulation of muddy sediment and the mixture of decayed vegetables, it would be converted into a swamp or morass.

On the surface of this morass or boggy ground, a fresh growth of plants and trees would now take place—of plants and trees somewhat different from the preceding, and consisting of reed-like plants, called Equisets and Calamites, with here and there a large tree. As these plants in their turn decayed, the decomposed matter furnished beds of peat, etc.

6. The succession of beds of coals, clays, sandstones, shales and limestones, implies that our lagoon or morass forest may, by a repetition of subsidences and elevations, have sunk beneath the level of the sea, and have rendered its basin the

Fig. 21 The North-east Portion of the Coal Measures in the Plauen Grund, near Dresden



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receptacle of deposits of sands and clays, which produced the strata of sandstone and shale, and occasionally limestone, between the seams of coal.

The alternation of the coal measures with marine deposits abounding in sea shells is explained by supposing that the area of the vegetation must have subsided beneath the level of a neighbouring or adjacent sea, in consequence of which depression, the submerged soil would become covered with marine sediments embedding the remains of sea animals.

In time, either by the deposition of sand, or mud or clay drifted from land, or by the elevation of the bed or bottom of the sea, the swamp or morass would be again and again filled, and become the area of a fresh growth of plants and trees, while the repetition of depressions and elevations accounts for the alternations of sandstone and shales.

IV. DISTURBANCES OF THE COAL BEDS.

After the completion of the coal strata, and before the formation of the Permian or New Red Sandstone beds, very great disturbances were produced, by volcanic agency, in the stratification.

1. In some cases the earthquake agency would curve the greatest portion of the beds, and tilt them upward at one of their extremities, as represented in fig 21.

In this illustration, the perpendicular black lines represent shafts sunk into the coal measures; the curved lines, the contorting influence of volcanic agency on the overlying beds; and the inclined lines on the extreme right, the dislocations of the coal seams by the upward pressure of porphyry and greenstone.

2. Such dislocations in the strata are called Faults, probably because when a miner is working in one of these beds, and comes to a fissure or crack, he finds himself *at fault*. In some cases the volcanic agency has dislocated a seam of coal in so many directions, that the mining engineer becomes greatly puzzled where and how to find the continuation of the bed. The engraving, fig. 22, will show how this occurs in coal fields.

The letters *a*, *b*, *c*, *d* represent shafts sunk in search of coal. At *c* the miner has reached the seam, which he may work right and left till he loses it. At *b* he is misled to think that he has reached a thicker seam of coal. At *c* he may think that he has found two beds. At *d* his shaft fails of the coal altogether

3. Sometimes the coal seams are pushed and turned into all manner of angles, so as to form a regular series of zigzags.

Fig. 24. The Zigzag Bendings of the Coal Measures at Charleroi, France; the perpendicular line representing the Coal Shaft.

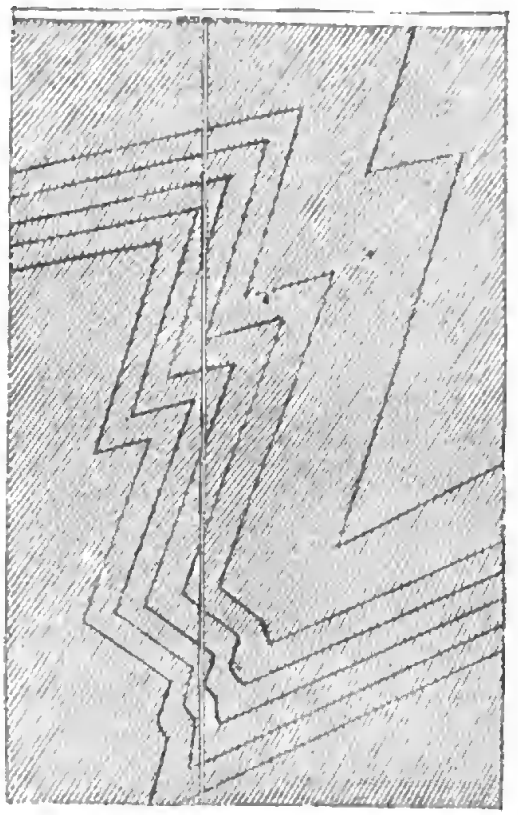
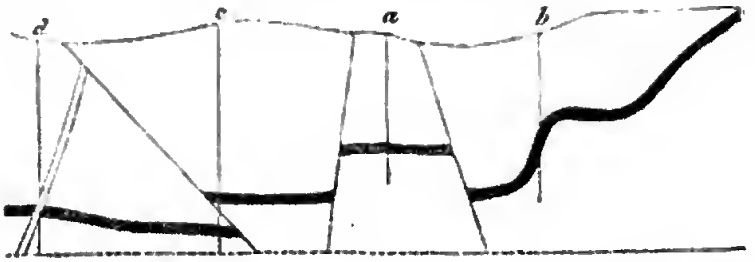
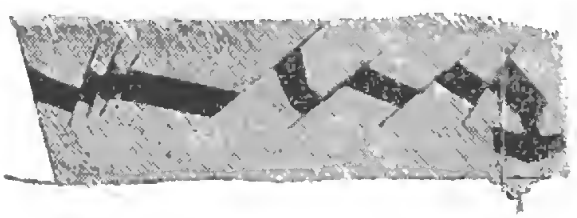


Fig. 22 Faults in a Coal Seam.



A very remarkable instance of such dislocation is represented in fig. 23.

Fig. 23. Various Dislocations of a Coal Bed at Vieille-Pompe, France.



Instances of these zigzag flexures are found at Mons, in Belgium, and at Charleroi, in France. In those cases, the shaft sunk in the coal measures cuts through the same bed of coal several times, in the manner represented in fig. 24.

4. Instead of bending the seams in an angular direction, as in the last illustration, sometimes the disturbing agency seemed as if in a freak, for it curves and twists them in the wildest manner. The next diagram, fig. 25, represents these dislocations and contortions of the coal seams. The vertical and the horizontal lines represent the shafts and the adits by which the miner seeks to find the coal.

5. The flexures, curvatures and contortions of the coal seams, represented in the preceding diagrams, are confined to comparatively narrow limits; but they are developed on an enormous scale in the Alleghanies, or Appalachian [Ap-pal-

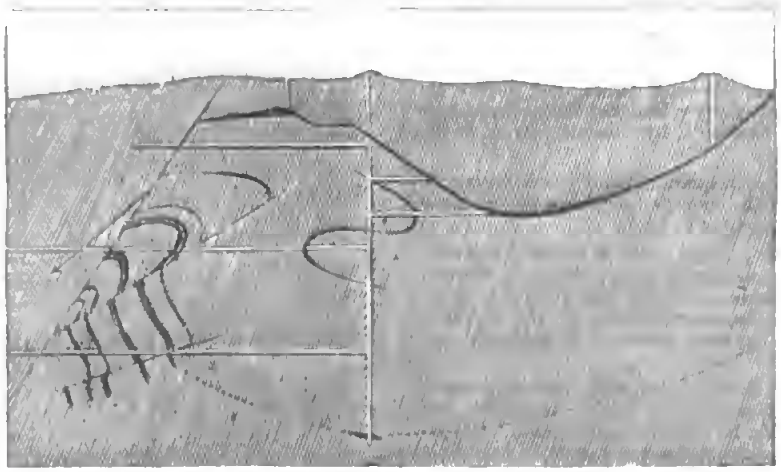
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ätch-yan] Mountains, in the United States of America, of which you have an outline in fig. 26.

In this diagram, A to B is part of the Atlantic plain; B to C the Atlantic slope; C to D the Appalachian Mountains; D to E part of the Appalachian coal field. 1. Chalk group. 2. Gneiss. 3. New Red Sandstone. 4. Silurian Rocks. 5. Old Red Sandstone. 6. The Coal Measures. 6'. Anthracite or Stone Coal. 7, 8 and 9. The parallel folds of the Appalachians becoming successively more open and flat in going from east to west—7 and 8 representing portions of the curved rocks removed by denudation.

The illustration shows, that on the eastern side the dips predominate to the south-east, in consequence of the beds having been folded back upon themselves, as under 7, while those on the north-west side of the arch have been inverted. The coal strata are horizontal to the westward of D, and become more and more curved as we come eastward towards C. It is invariably found that the coal is more pitchy towards the west, where it is horizontal. It becomes gradually less pitchy as we come to the south-eastward of D, from 9 to 6, where the beds are most disturbed. At length we come to a completely insulated coal field, 6', associated with the boldest flexure

Fig. 25. Beds of Coal contorted and dislocated, at Vieille-Pompe, France.

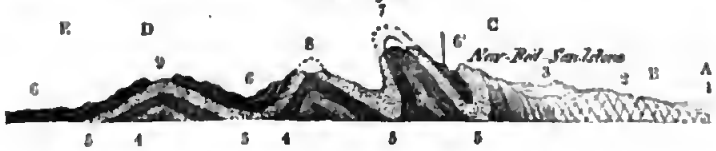


The Appalachian strata consist of Silurian, Devonian and Carboniferous rocks, extend from Vermont to Alabama, and are about 1,000 miles long, from 50 to 100 miles broad, and from 2,000 to 8,000 feet thick. These strata are all folded and bent into a succession of curves, convex and concave, parts of which, as at 7, 8, 9, have been subsequently exposed by denudation. The bendings and the breakings of the beds are greatest on the south-eastern side of the Atlantic districts; and as we go westward the strata become less and less distorted, until at length they regain at B their original horizontality.

where the strata are actually turned over, and where the coal has become pure anthracite.

This section teaches three lessons:—*First*, the flexure of the beds has been produced by the intrusion of igneous rocks, represented by 2. *Secondly*, the disturbance must have taken place before the bed 3, or New Red Sandstone, was deposited; for otherwise it also would have been tilted up. *Thirdly*, the peak in the New Red Sandstone, and the dotted curves in 7 and 8, show that enormous quantities of rock have been removed by denudation.

Fig. 26. The Geological Structure of the American Districts between the Atlantic and the Mississippi, as described by Sir Charles Lyell.



BIOGRAPHY.—No. XIX.

ROBERTSON.

By J. R. Beard, D.D.

Robertson forms one of the trio—Hume, Robertson and Gibbon—who together constitute the pedestal of English Historical Writing. Before them there was, strictly speaking, no history in the vernacular tongue of Great Britain. By profound research, by minute scrutiny, by accurate investigation, by careful comparison and exact representation, as well as by tracing events to their causes and exhibiting facts in their consequences,—in a word, by introducing science and system into the subject, and by spreading over it the soft and attractive light of a correct and elegant style, they converted the Chronicle into History, and carried History so far forward to perfection as to recall the ancient models offered in Tacitus, Thucydides and Xenophon, thereby forming a school the pupils in which may never surpass their masters, but must ever remain very largely in their debt.

William Robertson was born in the year 1721, at Borthwick, County of Mid-Lothian, Scotland, where his father was the parish minister. His first educational discipline he received from Leslie, a then celebrated teacher at Dalkeith. When his father in 1733 was promoted to a church in Edinburgh, he took his son with him, and sent him to the Metropolitan High School, where the boy found eminent instructors. On

terminating his studies, the young Robertson was in 1743 appointed minister at Gladsmuir, from which place he received only £100 a year. On this sum, however, he contrived to bring up seven brothers and sisters, thrown resourceless on his hands by the death of his parents. Necessity is said to be the mother of invention; she is certainly the parent of industry. Robertson was impelled by duty to turn his talents to account, and happily applied himself to historical studies. As the reward of some years' labour, he found his circumstances improve while his name grew into repute. While his "History of Scotland" (which appeared in 1751) was passing through the press, he received a call to a ministerial charge in the capital of his native land; in 1761 he was named Royal Chaplain of Scotland; in 1762 he became Principal of the University of Edinburgh; and two years after he received, with a salary of £200 a year, the title of Historiographer for the northern portion of Great Britain. The course of his life was little diversified, and certainly was unmarked and undisturbed by any of those signal events which in retrospect give interest to biography. Dr. Robertson died on the 11th of June, 1793, at his country-seat, Grange House, near Edinburgh.

A sermon which Robertson in 1755 preached before "The Scottish Society for the Propagation of the Gospel," is his only theological publication of a superior character. The theme of the discourse is, that God bestowed Christianity on the world at the exact time when it was most needed. As was natural in handling such a subject, he refers to the world as it was at the advent of the Saviour, and draws a vivid picture of its then political, social, moral and domestic condition. To his historical works, however, he owes his undying reputation. The first that appeared was the "History of Scotland during the Reigns of Queen Mary and King James VI. till his accession to the Crown of England." The catastrophe of the unfortunate (wicked is the right word) Mary Stuart and the history of the Reformation in Scotland which he narrates, procured for the work great attention. In a few weeks the general voice assigned him one of the first places among historical writers, an honour earned as well by his correct and nervous style, as by his well-grounded and judicious views. In foreign countries, too, the history was honourably received. Robertson had the satisfaction of seeing the fourteenth edition of this history before he left the world. The "History of Scotland" was followed by the instructive and attractive "History of the Reign of the Emperor Charles V. with a view of the progress of society in Europe, from the subversion of the Roman Empire to the beginning of the Sixteenth Century" (London 1769, 3 vols. 4to). Such was the earnest desire for the appearance of this work, that it brought its author the sum of £4,500. Of inferior worth is his "History of America," though the fourth book, which contains a picture of the physical condition of America, together with a disquisition on the manners and institutions of its inhabitants, is accounted Robertson's masterpiece; and certainly his skill in writing, his penetrating spirit of observation, and the beauty of his diction, never appeared in a more advantageous light than here. Robertson's last production was an "Historical Disquisition concerning the Knowledge which the Ancients had of India," (London, 1790). After his death there appeared (1798) a continuation of his "History of America," under the title, "The History of America, Book ix. and x., containing the History of Virginia to the year 1652." The manuscript was found by the author's son in a state apparently prepared for the press. Taken as a whole this fragment in no respect falls below the other works, and on every page the critical reader recognises Robertson's characteristic excellencies, the same power of combination, the same depth of reflection, the same charming flow of narration. A full "Account of the Life and Writings" of this distinguished historian was published by Dugald Stewart (London, 1801), forming one of three memoirs of Smith, Robertson, and Reid, read by that elegant writer before the Royal Society of Edinburgh.

The following extracts may serve as specimens of Robertson's style of writing.

MARTIN LUTHER.

"While appearances of danger daily increased, and the tempest which had been so long a gathering was ready to break forth in all its violence against the Protestant church, Luther was saved, by a reasonable death, from feeling or beholding its destructive rage. Having gone, though in a declining state of health, and during a rigorous season, to his native city of Eisenach, in order to compose, by his authority, a dissension among the counts of Mansfeld, he was seized with a violent inflammation in his stomach, which in a few days put an end to his life, in the sixty-third year of his age. As he was raised up by Providence to be the author of one of the greatest and most interesting revolutions recorded in history, there is not any person, perhaps, whose character has been drawn with such opposite colours. In his own age, one party, struck with horror and inflamed with rage, when they saw with what a daring hand he overturned everything which they held to be sacred, or valued as beneficial, imputed to him not only all the defects and vices of a man, but the qualities of a demon. The other, warmed with the admiration and gratitude which they thought he merited as the restorer of light and liberty to the Christian church, ascribed to him perfections above the condition of humanity, and viewed all his actions with a veneration bordering on that which should be paid only to those who are guided by the immediate inspiration of heaven. It is his own conduct, not the undistinguishing censure or the exaggerated praise of his contemporaries, that ought to regulate the opinions of the present age concerning him. Zeal for what he regarded as truth, undaunted intrepidity to maintain his own system, abilities, both natural and acquired, to defend his principles, and unwearied industry in propagating them, are virtues which shine so conspicuously in every part of his behaviour, that even his enemies must allow him to have possessed them in an eminent degree. To these may be added, with equal justice, such purity and even austerity of manners as became one who assumed the character of a reformer; such sanctity of life as suited the doctrine which he delivered; and such perfect disinterestedness as affords no slight presumption of his sincerity. Superior to all selfish considerations, a stranger to the elegancies of life, and despising its pleasures, he left the honours and emoluments of the church to his disciples, remaining satisfied himself in his original state of professor in the university, and pastor of the town of Wittemberg, with the moderate appointments annexed to these offices. His extraordinary qualities were alloyed with no inconsiderable mixture of human frailty and human passions. These, however, were of such a nature, that they cannot be imputed to malevolence or corruption of heart, but seem to have taken their rise from the same source with many of his virtues. His mind, forcible and vehement in all its operations, roused by great objects, or agitated by violent passions, broke out, on many occasions, with an impetuosity which astonishes men of feebler spirits, or such as are placed in a more tranquil situation. By carrying some praiseworthy dispositions to excess, he bordered sometimes on what was culpable, and was often betrayed into actions which exposed him to censure. His confidence that his own opinions were well founded, approached to arrogance; his courage in asserting them, to rashness; his firmness in adhering to them, to obstinacy; and his zeal in confuting his adversaries to rage and scurrility. Accustomed himself to consider everything as subordinate to truth, he expected the same deference for it from other men; and without making any allowances for their timidity or prejudices, he poured forth against such as disappointed him, in this particular, a torrent of invective mingled with contempt. Regardless of any distinction of rank or character when his doctrines were attacked, he chastised all his adversaries indiscriminately with the same rough hand; neither the royal dignity of Henry VIII., nor the eminent learning and abilities of Erasmus, screened them from the same gross abuse with which he treated Tetzel or Eccius.

"But these indecencies, of which Luther was guilty, must not be imputed wholly to the violence of his temper. They ought to be charged in part on the manners of the age. Among a rude people, unacquainted with those maxims which by putting continual restraint on the passions of individuals, have polished society and rendered it agreeable, disputes of every kind were managed with heat, and strong emotions were uttered in their natural language without reserve or delicacy. At the same time the works of learned men were all composed in Latin, and they were not only authorised, by the example of eminent writers in that language, to use their antagonists

with the most illiberal scurrility, but in a dead tongue indecencies of every kind appear less shocking than in a living language, whose idioms and phrases seem gross, because they are familiar.

"In passing judgment upon the characters of men, we ought to try them by the principles and maxims of their own age, not by those of another; for although virtue and vice are at all times the same, manners and customs vary continually. Some parts of Luther's behaviour, which appear to us most culpable, gave no disgust to his contemporaries. It was even by some of those qualities which we are now apt to blame that he was fitted for accomplishing the great work which he undertook. To rouse mankind, when sunk in ignorance or superstition, and to encounter the rage of bigotry armed with power, required the utmost vehemence of zeal, as well as a temper daring to excess. A gentle call would neither have reached nor have exalted those to whom it was addressed. A spirit more amiable, but less vigorous than Luther's, would have shrunk back from the dangers which he braved and surmounted."

MARY, QUEEN OF SCOTS.

"To all the charms of beauty, and the utmost elegance of external form, Mary, adding those accomplishments which render their impression irresistible, was polite, affable, insinuating, sprightly, and capable of speaking and writing with equal ease and dignity; sudden, however, and violent in all her attachments, because her heart was warm and unsuspicious; impatient of contradiction, because she had been accustomed from her infancy to be treated as a queen; no stranger, on some occasions, to dissimulation, which, in that perfidious court where she received her education, was reckoned among the necessary arts of government; not insensible to flattery, or unconscious of that pleasure with which almost every woman beholds the influence of her own beauty. Formed with the qualities we love, not with the talents that we admire, she was an agreeable woman rather than an illustrious queen. The vivacity of her spirit, not sufficiently tempered with sound judgment, and the warmth of her heart, which was not at all times under the restraint of discretion, betrayed her both into errors and crimes. To say that she was most unfortunate, will not account for that long and almost uninterrupted succession of calamities which befell her; we must likewise add, that she was often imprudent. Her passion for Darnley was rash, youthful and excessive. And though the sudden transition to the opposite extreme was the natural effect of her ill-requited love, and of his ingratitude, insolence and brutality; yet neither these, nor Bothwell's artful address and important services, can justify her attachment to that nobleman. Even the manners of the age, licentious as they were, are no apology for this unhappy passion; nor can they induce us to look on that tragical and infamous scene which followed upon it with less abhorrence. Humanity will draw a veil over this part of her character, which it cannot approve, and may, perhaps, prompt some to impute her actions to her situation more than to her disposition; and to lament the unhappiness of the former rather than accuse the perverseness of the latter. Mary's sufferings exceed, both in degree and duration, those tragical distresses which fancy has feigned to excite sorrow and commiseration; and while we survey them, we are apt altogether to forget her frailties; we think of her faults with less indignation, and approve of our tears, as if they were shed for a person who had attained much nearer to pure virtue.

"With regard to the queen's person, a circumstance not to be omitted in writing the history of a female's reign, all contemporary authors agree in ascribing to Mary the utmost beauty of countenance and elegance of shape of which the human form is capable. Her hair was black; though, according to the fashion of the age, she frequently wore borrowed locks and of different colours. Her eyes were of dark gray, her complexion was exquisitely fine, and her hands and arms remarkably delicate, both as to shape and colour. Her stature was of a height that rose to the majestic. She danced, walked and rode with equal grace. Her taste for music was just, and she sang and played upon the lute with uncommon skill. Towards the end of her life she began to grow fat; and her long confinement, and the coldness of the house in which she was imprisoned, brought on a rheumatism, which deprived her of the use of her limbs. 'No man,' says Brantome, 'ever beheld her person without admiration and love, or will read her history without sorrow.'"

LESSONS IN ALGEBRA.—No. XXIX.

(*Continued from page* 219.)

PROBLEMS IN GEOMETRICAL PROGRESSION.

PROB. 1. Divide the number 49 into two such parts, that the greater increased by 6 may be to the less diminished by 11 as 9 to 2.

Let $x =$ the greater, and $49 - x =$ the less.

By the conditions proposed, $x + 6 : 38 - x :: 9 : 2$
Adding terms, $x + 6 : 44 :: 9 : 11$
Dividing the consequents, $x + 6 : 4 :: 9 : 1$
Multiplying the extremes and means, $x + 6 = 36$. And $x = 30$.

Prob. 2. What number is that, to which if 1, 5, and 13 be severally added, the first sum shall be to the second as the second to the third?

Prob. 3. Find two numbers, the greater of which shall be to the less as their sum to 42, and as their difference to 6.

Prob. 4. Divide the number 18 into two such parts, that the squares of those parts may be in the ratio of 25 to 16.

Prob. 5. Divide the number 14 into two such parts, that the quotient of the greater divided by the less shall be to the quotient of the less divided by the greater as 16 to 9.

Prob. 6. If the number 20 be divided into two parts, which are to each other in the *duplicate* ratio of 3 to 1, what number is a mean proportional between those parts?

Prob. 7. There are two numbers whose product is 24, and the difference of their cubes is to the cube of their difference as 19 to 1: what are the numbers?

Prob. 8. There are two numbers in the proportion of 5 : 6; the first being increased by 4 and the last by 6, the proportion will be as 4 : 5: what are the numbers?

Prob. 9. A farmer has a quantity of corn in his granary, and sells a certain number of bushels, which is to the number of bushels remaining as 4 : 5. He then feeds out 10 bushels, which is to the number sold as 1 : 2. How many bushels had he at first, and how many did he sell?

Prob. 10. There are two numbers whose product is 135, and the difference of their squares is to the square of their difference as 4 to 1: what are the numbers?

Prob. 11. What two numbers are those, whose difference, sum and product, are as the numbers 2, 3 and 5, respectively?

Prob. 12. Divide the number 24 into two such parts, that their product shall be to the sum of their squares as 3 to 10.

Prob. 13. In a mixture of rum and brandy, the difference between the quantities of each is to the quantity of brandy as 100 is to the number of gallons of rum; and the same difference is to the quantity of rum as 4 to the number of gallons of brandy: how many gallons are there of each?

Prob. 14. There are two numbers which are to each other as 3 to 2; if 6 be added to the greater and subtracted from the less, the sum and remainder will be to each other as 3 to 1: what are the numbers?

Prob. 15. There are two numbers whose product is 320; and the difference of their cubes is to the cube of their difference as 61 to 1: what are the numbers?

Prob. 16. There are two numbers, which are to each other in the duplicate ratio of 4 to 3, and 24 is a mean proportional between them: what are the numbers?

CONTINUED GEOMETRICAL PROPORTION OR PROGRESSION.

When all the ratios of a series of proportionals are equal, the quantities are said to be in *continued proportion* or *progression*.

As arithmetical proportion continued is arithmetical progression, so geometrical proportion continued is geometrical progression. It is sometimes called progression by quotient.

The numbers 64, 32, 16, 8, 4, are in continued geometrical proportion.

In this series, if each preceding term be *divided* by the common ratio, the quotient will be the following term. Thus,

$\frac{64}{2} = 32$, and $\frac{32}{2} = 16$, and $\frac{16}{2} = 8$, and $\frac{8}{2} = 4$.

If the order of the series be *inverted*, the proportion will still

be preserved, and the common divisor will become a multiplier. In the series 4, 8, 16, 32, 64, etc,

$$4 \times 2 = 8, \text{ and } 8 \times 2 = 16, \text{ and } 16 \times 2 = 32, \text{ etc.}$$

Quantities then are in geometrical progression, when they increase by a common multiplier, or decrease by a common divisor.

This common multiplier or divisor is called the *ratio*. For most purposes, however, it will be more simple to consider the ratio as always a *multiplier*, either integral or fractional.

In the series 64, 32, 16, 8, 4, the ratio is either 2 considered as a divisor, or $\frac{1}{2}$ considered as a multiplier.

When several quantities are in *continued* proportion, the *number of couplets*, and of course the *number of ratios*, is *one less* than the number of quantities. Thus, the five proportional quantities a, b, c, d, e, form four couplets containing four ratios; and the ratio of $a : e$ is equal to the ratio of $a^4 : b^4$, that is, the ratio of the fourth power of the first quantity to the fourth power of the second. Hence,

If *three* quantities are proportional, *the first is to the third as the square of the first to the square of the second, or as the square of the second to the square of the third.* In other words, the first has to the third a *duplicate* ratio of the first to the second. And conversely, if the first of the three quantities is to the third as the square of the first to the square of the second, the three quantities are proportional.

If $a : b : : b : c$, then $a : c : : a^2 : b^2$. And universally,

If *several* quantities are in continued proportion, the ratio of the *first* to the *last* is equal to one of the intervening ratios raised to a power whose index is one less than the number of quantities.

If there are *four* proportionals, a, b, c, d, then $a : d : : a^3 : b^3$.
If there are *five*, a, b, c, d, e; $a : e : : a^4 : b^4$, etc.

If several quantities are in continued proportion, they will be proportional when the order of the whole is *inverted*. This has already been proved with respect to *four* proportional quantities. It may be extended to any number of quantities.

Between the numbers,	64, 32, 16, 8, 4,
The ratios are,	2, 2, 2, 2,
Between the same inverted,	4, 8, 16, 32, 64,
The ratios are,	$\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$.

So if the order of any proportional quantities be inverted, the ratios in one series will be the *reciprocals* of those in the other. For by the inversion each antecedent becomes a consequent, and *vice versa*; hnt the ratio of a consequent to its antecedent is the reciprocal of the ratio of the antecedent to the consequent. That the reciprocals of equal quantities are themselves equal, is evident from Ax. 4.

To investigate the properties of geometrical progression, we may take nearly the same course as in arithmetical progression, observing to substitute continual *multiplication and division*, instead of addition and subtraction. It is evident, in the first place, that,

In an ascending geometrical series, each succeeding term is found, by *multiplying the ratio* into the preceding term.

If the first term is a, and the ratio r,

Then $a \times r = ar$, the second term, or $ar \times r = ar^2$, the third,
$ar^2 \times r = ar^3$, the fourth, $ar^3 \times r = ar^4$, the fifth, etc.
And the series is a, ar, ar^2, ar^3, ar^4, ar^5, etc.

If the *first term* and the *ratio* are the *same*, the progression is simply a series of powers.

If the first term and ratio are each equal to r,

Then $r \times r = r^2$, the second term, $r^2 \times r = r^3$, the third,
$r^3 \times r = r^4$, the fourth, $r^4 \times r = r^5$, the fifth.
And the series is r, r^2, r^3, r^4, r^5, r^6, etc.

In a *descending* series, each succeeding term is found by *dividing* the preceding term by the ratio, or *multiplying* by the fractional ratio.

If the first term is ar^6, and the ratio r,

The second term is $\frac{ar^6}{r}$, or $ar^5 \times \frac{1}{r} = ar^5$,

And the series is ar^5, ar^4, ar^3, ar^2, ar, a, etc.

If the first term is a, and the ratio r,

The series is a, $\frac{a}{r}$, $\frac{a}{r^2}$, $\frac{a}{r^3}$, etc., or a, ar^{-1}, ar^{-2}, etc.
1st 2nd 3rd 4th 5th 6th

By attending to the series a, ar, ar^2, ar^3, ar^4, ar^5, etc., it will be seen that, in each term, the exponent of the power of the ratio is *one less* than the number of the term.

If then a = the first term, r = the ratio,
z = the last, n = the number of terms;
we have the equation $z = ar^{n-1}$, the last term, that is,

In geometrical progression, *the last term is equal to the product of the first into that power of the ratio whose index is one less than the number of terms.*

When the last term and the ratio are the *same*, the equation becomes $z = rr^{n-1} = r^n$.

Of the four quantities, a, z, r and n, any *three* being given, the other may be found.

1. By the last article,
$$z = ar^{n-1} = \text{the } \textit{last term}.$$
2. Dividing by r^{n-1},
$$\frac{z}{r^{n-1}} = a = \text{the } \textit{first term}.$$
3. Dividing the 1st by a and extracting the root,
$$\left(\frac{z}{a}\right)^{\frac{1}{n-1}} = r = \text{the } \textit{ratio}.$$

By the last equation may be found any number of *geometrical means* between two given numbers. If m = the number of means, $m + 2 = n$, the *whole* number of terms. Substituting $m + 2$ for n, in the equation, we have,

$$\left(\frac{z}{a}\right)^{\frac{1}{m+1}} = r, \text{ the ratio.}$$

When the ratio is found, the means are obtained by continued multiplication.

Prob. 1. Find two geometrical means between 4 and 256.
Ans. The ratio is 4, and the series is 4, 16, 64, 256.

Prob. 2. Find three geometrical means between $\frac{1}{4}$ and 9.

The next thing to be attended to is the rule for finding the *sum of all the terms.*

If any term, in a geometrical series, be multiplied by the ratio, the product will be the succeeding term. Of course, if *each* of the terms be multiplied by the ratio, a new series will be produced, in which all the terms except the last will be the same, as all except the first in the other series. To make this plain, let the new series be written under the other, in such a manner, that each term shall be removed one step to the right of that from which it is produced in the line above.

Take, for instance, the series,	2, 4, 8, 16, 32
Multiplying each term by the ratio,	4, 8, 16, 32, 64.

Here it will be seen at once, that the last four terms in the upper line are the same as the first four in the lower line. The only terms which are not in *both*, are the *first* of the one series, and the *last* of the other. So that when we subtract the one series from the other, all the terms except these two will disappear, by balancing each other.

If the given series is, a, ar, ar^2, ar^3, ... ar^{n-1}.
Then mult. by r, we have ar, ar^2, ar^3, ... ar^{n-1}, ar^n.

Now let s = the sum of the terms.

Then, $s = a + ar + ar^2 + ar^3, \ldots\ldots + ar^{n-1}$.
And mult. by r, $rs = ar + ar^2 + ar^3, \ldots\ldots + ar^{n-1} + ar^n$

Subt. the first equation from the second, $rs - s = ar^n - a$

And dividing by $(r - 1)$, $$s = \frac{ar^n - a}{r - 1}.$$

In this equation, ar^n is the last term in the new series, and

is therefore the product of the ratio into the last term in the *given series.*

Therefore, $s = \frac{rz - a}{r - 1}$, that is,

To find the sum of a geometrical series.

Multiply the last term into the ratio, from the product subtract the first term, and divide the remainder by the ratio less one.

Prob. 3. If in a series of numbers in geometrical progression, the first term is 6, the last term 1458, and the ratio 3, what is the sum of all the terms?

$$\text{Ans. } s = \frac{rz - a}{r - 1} = \frac{3 \times 1458 - 6}{3 - 1} = 2184.$$

Prob. 4. If the first term of a decreasing geometrical series is $\frac{1}{2}$, the ratio $\frac{1}{3}$, and the number of terms 5, what is the sum of the series?

Prob. 5. What is the sum of the series, 1, 3, 9, 27, etc., to 12 terms?

Prob. 6. What is the sum of ten terms of the series 1, $\frac{2}{3}$, $\frac{4}{9}$, $\frac{8}{27}$, etc.?

Prob. 7. If the first term of a series is 2, the ratio 2, and the number of terms 13, what is the last term?

Prob. 8. What is the 12th term of a series, the first term of which is 3, and the ratio 3?

Prob. 9. A man bought a horse, agreeing to give 1 penny for the first nail in his shoes, three for the second, and so on. The shoes contained 32 nails; what was the cost of the horse?

Quantities in geometrical progression are proportional to their differences.

Let the series be a, ar, ar^2, ar^3, ar^4, etc.

By the nature of geometrical progression,

$$a : ar :: ar : ar^2 :: ar^2 : ar^3 :: ar^3 : ar^4, \text{ etc.}$$

In each couplet let the antecedent be subtracted from the consequent.

Then $a : ar :: ar - a : ar^2 - ar :: ar^2 - ar : ar^3 - ar^2$, etc.

That is, the first term is to the second, as the difference between the first and second, to the difference between the second and third; and as the difference between the second and third, to the difference between the third and fourth, etc.

If quantities are in geometrical progression, their *differences* are also in geometrical progression.

Thus the numbers 3, 9, 27, 81, 243, etc.
And their differences 6, 18, 54, 162, etc., are in geometrical progression.

Problems in geometrical progression may be solved, as in other parts of algebra, by means of equations.

Prob. 10. Find three numbers in geometrical progression, such that their sum shall be 14, and the sum of their squares 84.

Let the three numbers be x, y, *and* z.

By the conditions, $x : y :: y : z$, or $xz = y^2$
And $x + y + z = 14$
And $x^2 + y^2 + z^2 = 84$

Ans. 2, 4 and 8.

Prob. 11. There are three numbers in geometrical progression whose product is 64, and the sum of their cubes is 584. What are the numbers?

Prob. 12. There are three numbers in geometrical progression: the sum of the first and last is 52, and the square of the mean is 100. What are the numbers?

Prob. 13. Of four numbers in geometrical progression, the sum of the first two is 15, and the sum of the last two is 60. What are the numbers?

Prob. 14. A gentleman divided 210 pounds among three servants, in such a manner that their portions were in geometrical progression; and the first had 90 pounds more than the last. How much had each?

Prob. 15. There are three numbers in geometrical progression, the greatest of which exceeds the least by 15; and the difference of the squares of the greatest and the least, is to the sum of the squares of all the three numbers as 5 to 7. What are the numbers?

Prob. 16. There are four numbers in geometrical progression, the second of which is less than the fourth by 24; and the sum of the extremes is to the sum of the means as 7 to 3. What are the numbers?

EVOLUTION OF COMPOUND QUANTITIES.

Rule.—I. *Arrange the terms according to the powers of one of the letters, so that the highest power shall stand first, the next highest next, etc.*

II. *Take the root of the first term, for the first term of the required root.*

III. *Subtract the power from the given quantity, and divide the first term of the remainder by the first term of the root involved to the next inferior power and multiplied by the index of the given power; the quotient will be the next term of the root.*

IV. *Subtract the power of the terms already found from the given quantity, and using the same divisor, proceed as before.*

Proof. *This rule verifies itself.* For the root, whenever a new term is added to it, is involved, for the purpose of subtracting its power from the given quantity: and when the power is *equal* to this quantity, it is evident the true root is found.

1. Extract the cube root of

$a^6 + 3a^5 - 3a^4 - 11a^3 + 6a^2 + 12a - 8 (a^2 + a - 2.$
a^6 the first subtrahend.

$3a^4) \ 3a^5$, etc., the first remainder.

$a^6 + 3a^5 + 3a^4 + a^3$, the 2nd subtrahend.

$3a^4) \ -6a^4$, etc., the 2nd remainder.

$a^6 + 3a^5 - 3a^4 - 11a^3 + 6a^2 + 12a - 8.$

2. Find the 4th root of $a^4 + 8a^3 + 24a^2 + 32a + 16$.
3. Find the 5th root of $a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$.
4. Find the cube root of $a^3 - 6a^2b + 12ab^2 - 8b^3$.
5. Find the square root of $4a^2 - 12ab + 9b^2 + 16ah - 24bh + 16h^2$.

N.B. In finding the divisor in the 5th example, the term 2a in the root is not involved, because the power next below the square is the first power.

The *square* root may be extracted by the following

Rule. I. *Arrange the terms of the given quantity according to the powers of one of the letters, take the root of the first term, for the first term of the required root, and subtract the power from the given quantity.*

II. *Bring down two other terms for a dividend. Divide by double the root already found, and add the quotient both to the root and to the divisor. Multiply the divisor thus increased, into the term last placed in the root, and subtract the product from the dividend.*

III. *Bring down two or three additional terms, and proceed as before.*

Proof. *Multiply the root into itself, and if the product is equal to the given quantity, the work is right.*

6. What is the square root of

$a^2 + 2ab + b^2 + 2ac + 2bc + c^2 (a + b + c$
a^2, the first subtrahend.

$2a + b) \ \ 2ab + b^2$
Into $b = \ \ 2ab + b^2$, the second subtrahend.

$2a + 2b + c) \ \ 2ac + 2bc + c^2$
Into $c = \ \ 2ac + 2bc + c^2$, the third subtrahend.

Proof.—The square of the root $a + b + c$ is equal to the given quantity.

For $(a + b)^2 = a^2 + 2ab + b^2 = a^2 + (2a + b) \times b$.
And substituting $h = a + b$, the square $h^2 = a^2 + (2a + b) \times b$.
And $(a + b + c)^2 = (h + c)^2 = h^2 + (2h + c) \times c$;
that is, restoring the values of h and h^2,
$(a + b + c)^2 = a^2 + (2a + b) \times b + (2a + 2b + c) \times c$.

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In the same manner it may be proved that, if another term be added to the root, the power will be increased, by the product of that term into itself, and into twice the sum of the preceding terms.

The demonstration will be substantially the same, if some of the terms be *negative*.

7. Find the square root of $1 - 4b + 4b^2 + 2y - 4by + y^2$.
8. Find the square root of $a^6 - 2a^5 + 3a^4 - 2a^3 + a^2$.
9. Find the square root of $a^4 + 4a^3b + 4b^2 - 4a^2 - 8b + 4$.

It will frequently facilitate the extraction of roots to consider the index as composed of two or more *factors*.

Thus $a^{\frac{1}{4}} = a^{\frac{1}{2}\times\frac{1}{2}}$. And $a^{\frac{1}{6}} = a^{\frac{1}{2}\times\frac{1}{3}}$. That is,

The *fourth* root is equal to the *square* root of the *square* root;
The *sixth* root is equal to the *square* root of the *cube* root;
The *eighth* root is equal to the *square* root of the *fourth* root, etc.

To find the *sixth* root, therefore, we may first extract the *cube* root, and then the *square* root of this.

10. Find the square root of $x^4 - 4x^3 + 6x^2 - 4x + 1$.
11. Find the cube root of $x^6 - 6x^5 + 15x^4 - 20x^3 + 15x^2 - 6x + 1$.
12. Find the square root of $4x^4 - 4x^3 + 13x^2 - 6x + 9$.
13. Find the 4th root of $16a^4 - 96a^3x + 216a^2x^2 - 216ax^3 + 81x^4$.
14. Find the 6th root of $x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$.
15. Find the 6th root of $a^6 - 6a^5b + 15a^4b^2 - 20a^3b^3 + 15a^2b^4 - 6ab^5 + b^6$.

LESSONS IN ITALIAN GRAMMAR.—No. XLIII.

Eleventh.—Verbs ending in *orre*

Pórre, to put.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *pórre*, to put	Past: *avére pósto*, to have put
Present Gerund: *ponéndo*, putting	Past Gerund: *avéndo pósto*, having put
Past Participle: *pósto*, put	

Indicative Mood.

Present.	*ponémmo*, we put
Póngo, I put	*poníste*, you put
poni, thou puttest	*pósero*, they put
póne, he puts	**Future.**
poniámo, we put	*Porrò*, I shall or will put
ponéte, you put	*porrái*, thou wilt put
póngono, they put	*porrà*, he will put
Imperfect.	*porrémo*, we will put
Ponéva or *ponéa*, I was putting	*porréte*, you will put
ponévi, thou wast putting	*porránno*, they will put
ponéva, *ponéa*, or *ponía*, he was putting	**Conditional Present.**
ponevámo, we were putting	*Porréi* or *porría*, I should or would put
ponevate, you were putting	*porrésti*, thou wouldst put
ponévano or *ponéano*, they were putting	*porrébbe* or *porría*, he would put
Indeterminate Preterite.	*porrémmo*, we would put
Pósi, I put	*porréste*, you would put
ponésti, thou puttest	*porrébbero*, they would put
póse, he put	

Imperative Mood.

[No First Person.]	*poniámo*, let us put
Póni, put (thou)	*ponéte*, put (ye or you)
pónga, let him put	*póngano*, let them put

Subjunctive Mood.

Present.	**Imperfect.**
Che pónga or *pógna*, that I may put	*Che ponéssi*, that I might put
che pónga or *pógni*, that thou mayst put	*che ponéssi*, that thou mightst put
che ponga or *pógna*, that he may put	*che ponésse*, that he might put
che poniámo, that we may put	*che ponéssimo*, that we might put
che poniáte, that you may put	*che ponéste*, that you might put
che póngano, that they may put	*che ponéssero*, that they might put

So conjugate—

Compórre, to compose	*Frappórre*, to interpose
Dispórre, to dispose	*Oppórre*, to oppose
Repórre, to replace	*Pospórre*, to delay.

Twelfth.—Verbs ending in *rrere*.

Córrere, to run.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *córrere*, to run	Past: *avére córso*, to have run
Present Gerund: *corréndo*, running	Past Gerund: *avéndo córso*, having run
Past Participle: *córso*, run	

Indicative Mood.

Present.	*corrémmo*, we ran
Córro, I run	*corréste*, you ran
córri, thou runnest	*córsero*, they ran
córre, he runs	**Future.**
corriámo, we run	*Correrò*, I shall or will run
corréte, you run	*correrái*, thou wilt run
córrono, they run	*correrà*, he will run
Imperfect.	*correrémmo*, we will run
Corréva, I was running	*correréte*, you will run
corrévi, thou wast running	*correránno*, they will run
corréva, he was running	**Conditional Present.**
correvámo, we were running	*Correréi*, I should or would run
correvate, you were running	*correrésti*, thou wouldst run
corrévano, they were running	*correrébbe*, he would run
Indeterminate Preterite.	*correrémmo*, we would run
Córsi, I ran	*correréste*, you would run
corrésti, thou ranst	*correrébbero*, they would run
córse, he ran	

Imperative Mood.

[No First Person].	*corriámo*, let us run
Córri, run (thou)	*corréte*, run (ye or you)
córra, let him run	*córrano*, let them run

Subjunctive Mood.

Present.	*che corréssi*, that thou mightst run
Che córra, that I may run	*che corrésse*, that he might run
che córra, that thou mayst run	*che corréssimo*, that we might run
che córra, that he may run	*che corréste*, that you might run
che corriámo, that we may run	*che corréssero*, that they might run
che corriáte, that you may run	
che córrano, that they may run	
Imperfect.	
Che corréssi, that I might run	

So conjugate—

Accórrere, to run to	*Discórrere*, to discourse
Concórrere, to run together,	

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Thirteenth.—Verbs ending in *tere.*

Méttere, to put.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *méttere,* to put	Past: *avére mésso,* to have put
Present Gerund: *metténdo,* putting	Past Gerund: *avéndo mésso,* having put
Past Participle: *mésso,* put	

INDICATIVE MOOD.

Present.	
Métto, I put	*mettémmo,* we put
métti, thou puttest	*mettéte,* you put
métte, he puts	*mísero,* they put
mettiámo, we put	
mettéte, you put	Future.
méttono, they put	*Metterò,* I shall or will put
Imperfect.	*metterái,* thou wilt put
Mettéva or *metléa,* I was putting	*metterà,* he will put
mettévi, thou wast putting	*metterémo,* we will put
mettéva or *metléa,* he was putting	*metterétu,* you will put
mettevámo, we were putting	*metteránno,* they will put
mettevate, you were putting	Conditional Present.
mettévano, mettéano, or *mettieno,* they were putting	*Metterèi* or *metterla,* I should or would put
Indeterminate Preterite.	*metterésti,* thou wouldst put
Misi, I put	*metterébbe* or *metterla,* he would put
mettésti, thou puttest	*metterémmo,* we would put
mise, he put	*metteréste,* you would put
	metterébbero, metteriano, or *metterieno,* they would put

IMPERATIVE MOOD.

[No First Person.]	
Métti, put (thou)	*mettiámo,* let us put
métta, let him put	*mettéte,* put (ye or you)
	méttano, let them put

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che métta, that I may put	*Che mettéssi,* that I might put
che métta, that thou mayst put	*che mettéssi,* that thou mightst put
che métta, that he may put	*che mettésse,* that he might put
che mettiámo, that we may put	*che mettéssimo,* that we might put
che mettíate, that you may put	*che mettéste,* that you might put
che méttano, that they may put	*che mettéssero,* that they might put

So conjugate—

Infinitive.	Present.	Indat. Pret.	Past Part.	English.
Consistere,	*consisto,*	*consistéi,*	*consistito,*	to consist
Assistere,	*assisto,*	*assistéi,*	*assistito,*	assist
Resistere,	*resisto,*	*resistéi,*	*resistito,*	resist
Avértere,	*avérto,*	*avérsi,*	*avérso,*	turn off
Percuótere,	*percuóto,*	*percóssi,*	*percósso,*	strike
Riscuótere,	*riscuóto,*	*riscóssi,*	*riscósso,*	receive
Scuótere,	*scuóto,*	*scóssi,*	*scósso,*	shake off
Prométters,	*prométto,*	*promísi,*	*promésso,*	promise
Connétters,	*connétto,*	*connéssi,*	*connésso,*	unite
Genuflétters,	*genuflétto,*	*genuflessi,*	*genuflesso,*	kneel
Riflettere,	*riflétto,*	*riflessi,*	*riflesso,*	reflect
Insistere,	*insisto,*	*insistéi,*	*insistito,*	insist
Discútere,	*discúto,*	*discussi,*	*discusso,*	examine.

Fourteenth.—Verbs ending in *arre.*

Trárre, to draw.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *trárre,* to draw	Past: *avére trátto,* to have drawn
Present Gerund: *traéndo,* drawing	Past Gerund: *avéndo trátto,* having drawn
Past Participle: *trátto,* drawn	

INDICATIVE MOOD.

Present.	
Trággo, I draw	*trásse,* he drew
trái or *trággi,* thou drawest	*traémmo,* we drew
trae or *tragge,* he draws	*traéste,* you drew
trajámo or *traggiámo,* we draw	*trássero* or *trásseno,* they drew
traéte, you draw	Futura.
trággono or *tránno,* they draw	*Trarrò,* I shall or will draw
Imperfect.	*trarrái,* thou wilt draw
Traéva or *traéa,* I was drawing	*trarrà,* he will draw
traévi, thou wast drawing	*trarrémo,* we will draw
traéva or *traéa,* he was drawing	*trarréte,* you will draw
traevámo, we were drawing	*trarránno,* they will draw
traevate, you were drawing	Conditional Present.
traévano, traéno, or *traéano,* they were drawing	*Trarrèi* or *trarría,* I should or would draw
Indeterminate Preterite.	*trarrésti,* thou wouldst draw
Trássi, I drew	*trarrébbe* or *trarría,* he would draw
tradésti, thou drewest	*trarrémmo,* we would draw
	trarréste, you would draw
	trarrébbero, they would draw

IMPERATIVE MOOD.

[No First Person.]	
Trái, draw (thou)	*traiámo* or *traggiámo,* let us draw
trágga, let him draw	*traéte,* draw (ye or you)
	trággano, let them draw

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che tragga, that I may draw	*Che traéssi,* that I might draw
che trágga, that thou mayst draw	*che traéssi,* that thou mightst draw
che trágga, that he may draw	*che traésse,* that he might draw
che traiámo or *traggiámo,* that we may draw	*che traéssimo,* that we might draw
che traiáte or *traggiáte,* that you may draw	*che traéste,* that you might draw
che trággano, that they may draw	*che traéssero,* that they might draw

So conjugate—

Attrárre, to attract	*Distrárre,* to take off
Contrárre, to contract	*Ritrárre,* to draw out

Sottrárre, to subtract.

Fifteenth.—Verbs ending in *vere.*

Móvere or *muóvere,* to move.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *Móvere* or *muóvere,* to move	Past: *avére mósso,* to have moved
Present Gerund: *Movéndo* or *muovéndo,* moving	Past Gerund: *avéndo mósso,* having moved
Past Participle: *mósso,* moved	

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INDICATIVE MOOD.

Present.	
Muóvo or *móvo*, I move	*movémmo*, we moved
muóvi, thou movest	*movéste*, you moved
muóve, he moves	*móssero*, they moved
moviámo, we move	Future.
movéte, you move	*muoverò*, I shall or will move
muóvono, they move	*muoverai*, thou wilt move
Imperfect.	*muoverà*, he will move
Movéva, I was moving	*muoverémo*, we will move
movévi, thou wast moving	*muoveréte*, you will move
movéva, he was moving	*muoverànno*, they will move
movevámo, we were moving	Conditional Present.
movevàte, you were moving	*muoverèi*, I should or would move
movévano, they were moving	*muoverésti*, thou wouldst move
Indeterminate Preterite.	*muoverèbbe*, he would move
mòssi, I moved	*muoverémmo*, we would move
movésti, thou movedst	*muoveréste*, you would move
mósse, he moved	*muoverèbbero*, they would move

IMPERATIVE MOOD.

[No First Person.]	
Muóvi, move (thou)	*moviámo*, let us move
muóva, let him move	*moviàte*, move (ye or you)
	muóvano, let them move

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che muóva, that I may move	*Che movéssi*, that I might move
Che muóva, that thou mayst move	*che movéssi*, that thou mightst move
che muóva, that he may move.	*che movésse*, that he might move
che moviámo, that we may move	*che movéssimo*, that we might move
che moviàte, that you may move	*che movéste*, that you might move
che muóvano, that they may move.	*che movéssero*, that they might move

LESSONS IN SPANISH.—No. XIII.

CONJUGATION.—*Continued.*

REFLECTIVE VERBS.

THOSE verbs are called *reflective* or *reciprocal* which *reflect* the action they express on their nominative; as, *Yo me desnudo*, or *me desnudo*, I undress myself; *el se ahorcó*, or *se ahorcó*, he hung himself; *nosótros nos amamos*, we love ourselves, or, we love each other.

The reflective verbs are inflected in the same manner as the verb would be conjugated if it were employed without the reflective pronouns. The verb *ahorcar* is thus conjugated reflectively:—

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *ahorcárse*, to hang one's self.	Past: *habérse ahorcado*, to have hung one's self.
Present Gerund: *ahorcándose*, hanging one's self.	Past Gerund: *habiéndose ahorcado*, having hung one's self.
Past Participle: *ahorcádo*, hung one's self.	

INDICATIVE MOOD.

Present.	Perfect Indefinite.
1 *Me ahorco*, I hang myself.	1 *Me he ahorcado*, I have hung myself.
2 *Te ahorcas*, thou hangest thyself.	2 *Te has ahorcado*, thou hast hung thyself.
3 *Se ahorca*, he hangs himself.	3 *Se ha ahorcado*, he has hung himself.
1 *Nos ahorcamos*, we hang ourselves.	1 *Nos hemos ahorcado*, we have hung ourselves.
2 *Os ahorcáis*, you hang yourselves.	2 *Os habéis ahorcado*, you have hung yourselves.
3 *Se ahorcan*, they hang themselves.	3 *Se han ahorcado*, they have hung themselves.

And thus through all the moods and tenses

It must not be forgotten that the reflective pronouns are always in the objective case, and governed by the verb which comes after them or to which they are joined (for they are always joined to infinitives, gerunds, and imperatives). The nominative personal pronouns are not generally used.

THE PASSIVE VERB.

A passive verb is conjugated by adding to the auxiliary verb *ser*, through all its moods and tenses, the past participle of the verb to be conjugated. The participle in such a case is inflected by gender and number like an adjective; thus to say—he is loved; she is loved; they are loved (masc.); they are loved (fem.); would be—*el es amado; ella es amada; ellos son amados; ellas son amadas.*

The passive verb formed by *ser* is used in Spanish in the present and imperfect tenses of the indicative mood only when a mental act or state of the emotions is spoken of; thus we can say *ella es amada*, she is loved; but we cannot say *ella es hallada*, she is found; since in the latter case no state of mind or feelings is described, and the perfect indefinite tense must be employed; thus, *ella ha sido hallada*, she has been found. For the past tense of the indicative, when no state or act of the mind is spoken of, the perfect definite must be used, as *la casa fué* (not *era*) *quemada*, the house was burnt.

Conjugation of the passive verb, *ser hallado*:—

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *ser hallado*, to be found.	Past: *haber sido hallado*, to have been found.
Present Gerund: *siendo hallado*, being found.	Past Gerund: *habiendo sido hallado*, having been found.
Past Participle: *sido hallado*,* been found.	

INDICATIVE MOOD.

Present.	Perfect Definite.
I am found, etc.	I was found, etc.
Soy hallado,	*Fui hallado,*
Eres hallado,	*Fuiste hallado,*
Es hallado,	*Fué hallado,*
Somos hallados,	*Fuimos hallados,*
Sois hallados,	*Fuisteis hallados,*
Son hallados,	*Fueron hallados,*
Imperfect.	First Future.
I was found, etc.	I shall or will be found, etc.
Era hallado,	*Seré hallado,*
Eras hallado,	*Serás hallado,*
Era hallado,	*Será hallado,*
Éramos hallados,	*Seremos hallados,*
Erais hallados,	*Seréis hallados,*
Eran hallados,	*Serán hallados,*

* *Hallado* means "been found," as well as "found," so that *sido* is not used in forming the passive past participle.

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Imperative Mood.

Let me be found; be thou found, etc.

Séa yo hallado,	*Seamos nosotros hallados,*
Sé tú hallado,	*Séd vosotros hallados,*
Sea él hallado,	*Sean ellos hallados,*

Subjunctive Mood.

Present.

I may be found, etc.

Séa hallado,
Seas hallado,
Séa hallado,
Seamos hallados,
Seais hallados,
Sean hallados,

Imperfect.

I would, should, might be found, etc.

Fuera, seria, fuese hallado,
Fueras, serias, fueses hallado,
Fuera, seria, fuese hallado,
Fuéramos, seriamos, fuésemos hallados,
Fuérais, seriais, fueseis hallados,
Fueran, serian, fuesen hallados,

First Future.

If I should be found, etc.

Si fuere hallado,
Si fueres hallado,
Si fuere hallado,
Si fuéremos hallados,
Si fuéreis hallados,
Si fueren hallados,

The compound tenses of the passive verb are formed by the several simple tenses of *haber*, and the passive past participle of the verb to be conjugated; as,

He sido hallado, I have been found.	*Habré sido hallado*, I shall have been found.
Habia sido hallado, I had been found.	*Si hubiere sido hallado*, if I should have been found.

Remark.—The exercises in this lesson are designed for practice in reflective verbs and passive verbs.

Se and the other personal pronouns of the first-objective case are often used in Spanish with neuter or active intransitive verbs, and in such cases seem redundant in English; as, *V. se burla*, you jest; *mucho me alegro*, I rejoice much; *se caerá vmd.*, you will fall; *retirese vmd.*, retire; *no se enoje vmd.*, do not be angry. Those verbs designated with a (*) in the vocabulary, are thus used.

Vocabulary.

Levantar, to raise; *levantarse*, to rise.	*Meterse*,* to meddle, to interfere.
Portarse,* to behave, to conduct one's self.	*Retirarse*,* to retire, to withdrew.
Quejarse,* to complain.	*Burlarse*,* to jest.
Acercarse,* to approach, to draw near.	*Alegrarse*,* to rejoice.
Salvar, to save.	*Juntarse*,* to assemble.
Alabar, to praise.	*Esconder*, to hide.
Armar, to arm.	*Pais* (masc.), country, region.
Invierno, winter.	*Primavera*, spring.
A' las seis, at six o'clock.	*A las siete*, at seven o'clock.
Bien, well, properly.	*Mal*, badly, improperly.

Model Sentences.

Los amigos se juntaron en Lóndres, the friends assembled (themselves) in London.	*Levantáos*, raise yourselves, i. e. rise.
Me hallo contento, I find myself (*i. e.* I am) contented.	*V. se burla*, you jest.
	No se enoje V., do not complain.

Spanish-English.

¿Cómo se halla vmd.? Juan se porta bien. Los abogados se portan mal. Te portas bien. Os portáis mal. Ellas se juntaron en Madrid. El carpintero se halla contento. Le amas. Pedro se alabó. La muger se escondió. El general se armó. Se alaban mis hermanas. Se salvaron. Me alabó. Te armas. Me escondí. Nos armemos. Nos escondimos. Se han portado mal. ¡Ojalá me hallase con ella! ¡Ojalá se portasen bien! Tus amigos se juntarán en Lóndres. Escóndete. Alabéos. Salváos. Armémonos. Alábese vmd. Arméese vmd.

Te burlas. Me alegro mucho. Se acerca la primavera. Se acerca el invierno. Se quejan. V. se burla. Te alegras. Pedro se queja. Se ha levantado V. ¿De quién se quejan? ¿Me ho metido nunca (*ever*) en sus asuntos (*affairs*) de vmd.? Siempre me levanto á las seis. Me retiraré. ¿No se retiraria V. del pais? ¿No se retirarian del paie? Siempre nos levantámos á las siete. Se alegran. Alégrate. Alegráos. Alegrémonos. Alégrense. Levántese V. No se queje V. No nos quejemos. No nos metamos en los asuntos del juez.

English-Spanish.

How do you (*vmd.*) find yourself (how finds your-worship himself)? Peter behoves himself well. The lawyers conduct themselves badly. Thou behavest thyself well. Ye-behove yourselves badly. They assembled (themselves) in Madrid. The carpenter is (say, finds himself) contented. Thou-lovest thyself. John praises himself. The woman hid herself. The general armed himself. My[3] brothers[4] praise[2] themselves[1]. They-saved themselves. I-praise myself. Thou-ermest thyself. I-hid myself. We-arm ourselves. We-hid ourselves. They-have behaved themselves badly. O-that *I*-might-find myself with her! O that they-would-conduct themselves well! Thy friends will-assemble (themselves) in London. Hide thyself. Praise-ye yourselves. Save yourselves. Let-us-arm ourselves. Praise yourself (let your-worship praise himself). Arm yourself.

Thou-jestest. I-rejoice much. Tho[6] spring[5] approaches[4]. The[2] winter[3] draws near.[1] They-complain. You (*V.*) jest. Thou-rejoicest. Peter complains. You[3] (*V.*) have[1] risen.[2] Of whom do they complain? Have-I ever (*nunca*) meddled in your (*de vmd.*) affairs (*asuntos*)? I always rise at six o'clock. I-will-retire. Would you (*V.*) not retire from-the (*del*) country? We always rise at seven o'clock. They-rejoice. Rejoice-thou. Rejoice-ye. Let-us-rejoice. Let-them-rejoice. Rise (let your-worship raise himself). Complain not (let not your worship complain himself). Let us not complain. Let us not meddle in the affairs (*asuntos*) of the judge.

Remark.—The inflections of reflective verbs should now be written in all the moods and tenses of the three regular conjugations.

Vocabulary.

Quemar, to burn.	*Vencer*, to conquer, to surpass.
Maltratar, to abuse.	*Criar*, to create.
Calumniar, to calumniate.	*Presentar*, to present.
Generosidad, generosity.	*Tierra*, the earth.
Embajador, ambassador.	*Presidente*, president.
Ayer, yesterday.	*Abiertamente*, openly.

Model Sentences.

*Este libro fué escrito** *para mis amigos*, this book was written for my friends.	the houses have been burnt.
Las casas han sido quemadas,	*María es amada de José*, Mary is loved by Joseph.

Spanish-English.

Lucia es amada de Diego. La Española es amada del Frances. Fulmos vencidos en generosidad. La tierre fué criada por Dios. Ella fué calomniada abiertemente. Fueron vencidos an generosidad. Todas las cosas fueron criadas por Dios. Esta carta fué escrita para María. Esos libros fueron escritos por el abogado. He sido maltratado. La ciudad fué quemada. La case fué quemada. Ayer fué[4] presentado[3] el[1] embajador[2] frances[2] á la reina de la Inglaterra. Ayer fueron presentadas al á la reina las hermanas y hijas del embajador[2] español[1]. Las Francesas fueron calumniados abiertamente. Estoe caballeros hao sido maltrados. Las ciudades hen sido quemadas. La ciudad será quemada. No seremos vencidos en generosidad. Ayer fué presentado á la reina al hijo de embajador[2] frances[1]. Ayer fué presentado á la reina[2] inglesa[1].

* *Escrito* is the past participle (irregularly formed) of the verb *escribir*.

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English-Spanish.

Mary is loved by (*de*) James. The Spanish-women is loved by the Frenchman. We were (perf. def.) surpassed in generosity. The earth was (perf. def.) created by (*por*) God. She was (perf. def.) calumniated openly. They were surpassed in generosity. All things were created by God. This letter was written (*escrita*) for Mary. Those books were written by the lawyer. I have been abused. The city was (perf. def.) burnt. The house was burnt. Yesterday the[3] French[3] ambassador[4] was[1] presented[2] to the queen of England. Yesterday the sisters and daughters of the Spanish[2] ambassador[1] were presented to the queen. The French-women were calumniated openly. These gentlemen have been abused. The cities have been burned. The city will be burnt. We shall not be surpassed in generosity. Yesterday the son of the English[2] ambassador[1] was presented to the queen. Yesterday I was presented to the queen.

Remark.—The inflections of passive verbs should now be written in all the moods and tenses of the three regular conjugations.

Instead of employing the auxiliary verb *ser*, to be, and the participle of the verb agreeing with its nominative, the personal reflective pronoun *se* is often used in the third person singular and plural with the proper tense of the active verb. Thus, we may say *el libro ha sido hallado*, or *el libro se ha hallado*,* and both forms are to be rendered in English, "the book has been found." This is a very important rule of Spanish grammar, and must be kept in mind by the student. The following will serve as examples of this method of placing *se* before the verb, which in such a case corresponds to the same tense conjugated passively.

El libro se ha hallado, the book has been found.	*Las aguas se tornaron amargas*, the waters are turned bitter.
El libro se abre, the book is opened, or opens.	*La casa se quemó*, the house was burnt.
El se llamaba Caifás, he was called Caiaphas.	*Aquí se habla Español*, Spanish is spoken here.
La voz se repitió, the voice was repeated.	*Se dice*, It is said.
Su glória se verá, his glory shall be seen.	*Se publicó*, It was published.

The above examples rendered literally mean—the book has found itself; the book opens itself; he called himself Caiaphas; the voice repeated itself; his glory shall see itself; the waters turned themselves bitter; here speaks itself Spanish; the house burnt itself; it says itself; it published itself. We may say in English, the voice prolongs itself, or, the voice is prolonged; the man deceives himself, or, the man is deceived; so that the only difference between the Spanish and English syntax in this matter is, that the rule is applied far more extensively in Spanish than in English. Thus we may say, in both languages, the voice repeats itself, *la voz se repite*, meaning, the voice is repeated; but we cannot say in English, the sound hears itself, for "the sound is heard." In Spanish, however, we can say, *la voz se oyó*, or, *la voz fué oida*, the voice was heard.

Remark.—The exercises in this portion of the lesson are designed to show the manner in which the reflective personal pronoun *se* is employed in Spanish to express passive action. Thus it can be said in Spanish, *en la Gaceta de York de ayer se leen las siguientes líneas*, in the York Gazette of yesterday *read themselves* the following lines, meaning, in yesterday's York Gazette the following lines are (or may be) read. *¿Cómo* se entenderá *lo que* se dice? how *shall-understand itself* that which *says itself*? meaning, how shall be understood that which is said? *Las ventanas* se han cerrado, the windows *have shut themselves*, meaning, the windows have been shut. It is believed, it is said, the book is opened, can be rendered in Spanish by the reflective pronoun, thus, *se cree, se dice, se abre el libro;* literally, it-believes itself, it says itself, the book opens itself. This peculiar manner of expressing a passive act or emotion must be carefully noted.

* Literally, "the book has found itself."

Vocabulary.

Llamar, to call, to name.	*Llenar*, to fill.
Doblar, to double, to increase.	*Continuar*, to continue.
Usar, to use.	*Engañar*, to deceive.
Creer, to believe, to think.	*Vender*, to sell.
Abrir, to open.	*Botella*, bottle.
Clamor, noise, clamour.	*Escuela*, school.
Humo, smoke.	*Puerta*, door.
Profecía, prophecy.	*Sitio*, siege.

Model Sentences.

Aquí se[3] *habla*[3] *Español*[1], here Spanish is spoken.	*Pedíd, y se*[3] *os*[3] *dará*[1], ask-ye, and it shall be given to-you.
La ísla se llamaba Melita, the island was called Melita.	*Se*[3] *han*[3] *segado*[4] *los*[1] *prados*[2], the meadows have been moved.
El río se ha helado, the river is (has been) frozen.	

In many of the following sentences the nominative will be found placed after the verb, this being a very common order of construction in Spanish, especially in sentences in which *se*, with the active verb, is used in place of the passive verb.

Spanish-English.

Esta muger se llama María. Aquí se háble el Iegles. Se cree. Llamad, y se os ehrirá. Este vino se vende á tres pesos la botella. Se doble el clamor. Se enegeño V. ¿Se usan plumas de oro? ¿Qué libros se usen en esa escuela? La botella se llenará de (with) vino. Las botellas se llenarán de água. La casa se llenará de humo. Se llanó toda la cuided de humo. Se abrirán las puertas. Aquí se habla el Frances. Se cumple la profecía. Se ebrirá la posrte. La cuidad es qoemó. Las casas se quemaroo. Se ehrió el libro. Aqui se venden libros. Este vino se vende á dos pesos le botella. Se cumplen las profecías. Se continuare le carta. Este hombre se llome Pedro. Se ebrieron todas las puertas. Se continuarán esas cartas. Se doblará el clamor. Se engeñan los jueces. Esa profesía se he cumplido. Se ha engeñado vmd. Se hehle de un sitio. Se he levantado el sitio. ¿Se usan sombreros de seda? Las casas se llenaron de humo.

English-Spanish.

This woman is called Mary. Here French is spoken. It is believed. Knock (*llamád*), and it shall be opened to-you. This wine is sold at (*á*) three shillings a (*la*) bottle. The clamour is doubled. You (*V.*) are deceived. Are gold pens used? What books are used in that school? The bottles will be filled with (*de*) wine. The bottles will be filled with (*de*) water. The house will be filled with smoke. All the city will be filled with smoke. The doors will be opened. Here English is spoken. The prophecy is fulfilled. The door will be opened. The city is burned (perf. def.). The houses are burned. The book is opened (perf. def.). Here books are sold (pres). This wine is sold at two shillings a bottle. The prophecies are fulfilled (pres.) The letter will be continued. This man is called Peter. All the gates were opened (perf. def.). Those letters will be continued. The clamour will be doubled. The judges are deceived. The prophecy has been fulfilled. You (*vmd.*) have been deceived. It is spoken of a siege.* The siege has been raised. Are silk hats used? The houses were filled (perf. def.) with smoke. Those prophecies have been fulfilled.

The passive verb is sometimes formed by the auxiliary verb *estar*, instead of *ser*; as, *el caballo está lastimado*, the horse is injured; *las casas está mal construida*, the house is badly constructed.

Verbs are conjugated interrogatively, by placing the pronoun

* In English it would be better to say, a siege is spoken of. In Spanish it can be said, *hablan de un sitio*, they (*i. e.* people) speak of a siege.

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after the verb; and negatively, by placing the adverb no before the verb; as,

¿ Amo yo ? love I? or, do I love?	*El no come*, he does not eat.
¿ Come él ? does he eat?	*Ellos no escribirian*, they would not write.
¿ Escribirian ellos ? would they write?	*¿ No apprenderás tú ?* wilt thou not learn?
Yo no amo, I do not love.	

If an objective pronoun come before the verb, the negative *no* is then placed immediately before such pronoun; as,

¿ No lo habeis oido ? have ye not heard it?	*Yo no le vi*, I saw him not.

It is not the general practice to use the nominative personal pronouns in asking questions; thus, *¿ amo ? ¿ come ?* mean the same as *¿ amo yo ? ¿ come tú ?* Nor is it absolutely necessary to place the nominative pronoun or noun after the verb, as the interrogation mark shows the sentence to be interrogatory; thus, *¿ yo amo ? ¿ amo yo ?* or *¿ amo ?* each means, do I love?

One of the most important rules in Spanish syntax is that by which a noun in the objective case, if it be a person, or inanimate thing personified, and the direct object of a verb, is to be preceded by the preposition *á*. Thus, John loves his brother, would be in Spanish, *Juan ama á su hermano*,* and not *Juan ama su hermano*; Peter slew the barber, would be, *Pedro mató al barbero*,* and not *Pedro mató el barbero*; I love those who love me, would be, *amo á los que me aman*, and not *amo los que me aman*. These sentences can be altered in construction, without any change of meaning. Of course the preposition is not to be translated in English, but must always be used in Spanish before nouns in the objective case, governed by an active verb, if these nouns express a rational being or personified object.†

Vocabulary.

Honrar, to honour.	*Sanar*, to heal, to cure.
Temer, to fear.	*Perdonar*, to forgive, to pardon.
Robar, to rob.	*Matar*, to slay, to kill.
Recompensar, to reward.	*Visitar*, to visit.
Deudor, debtor.	*Noche* (fem.), night.

Model Sentences.

Ama a nuestra nacion, he loves our nation.	*Vi á una muger*, I saw a woman.
Cain mató á su hermano Abel, Cain slew his brother Abel.	*A nádie vió*, he saw nobody.
	Le amo como á un hermano, I love him like a brother.

Spanish-English.

El padre á sus hijos. Honramos al juez. El médico sana á los enfermos. Este juez no teme á Dios. Perdonamos á nuestros deudores. Yo perdono á mis deudores. Dios ame á los que son buenos. Llamaron á los pintores. Ella tema al Americano. El médico sanará á muchos enfermos. El juez perdonó al hombre que robo al padre de Pedro. Robaron á la muger á quien recompensamos. Mi criado mató á su padre. Honrad á vuestros padres (parents). Perdoné á todos mis deudores. Te amo como (like) á un padre. Pedro me ama como á un hermano. Las señoras recompensarán á sus criadas. Visitaremos el presidente esta noche (to-night). Visitaremos á algunos de mis amigos esta noche. Recompensaré al que me honra. La madre ama á sus hijas. Juan mató á su amigo.

English-Spanish.

The mother loves her daughters. We honour the judge. The physician heals the sick. This judge fears not God. We pardon our debtors. I forgive my debtors. God loves those who are good. They called the painters. She fears the American. The physician will heal many sick [persons]. The judge pardoned the man who robbed Peter's father. They robbed the woman whom we rewarded. My male-servant slew his father. Honour ye your parents (*padres*). I pardoned all my debtors. I love thee like (*como*) a father. Peter loves me like a brother. The ladies will reward their female-servants. We will visit the queen this night. We will visit some of my friends to-night (*esta noche*). I will reward him who honours me. The father loves his sons. John killed his friend.

* Literally, John loves *to* his brother; Peter slew *to* the barber.

† This rule applies only to rational beings or personified objects; thus we cannot say, *amo á la verdad*, but *amo la verdad*, I love the truth.

ANSWERS TO CORRESPONDENTS.

D. D.—Problems received. Correct.

J. W. Best.—No key has been published.

A Subscriber will find some excellent advice on punctuation in Fowler's volume on the "English Language."

Daddy Longlegs.—The Registrar of the University of London will supply the examination lists on application.

W. D. (Portobello).—We are sorry we cannot avail ourselves of your communication.

A. Sheppard.—The Lessons in French are admirably adapted for the purpose.

Cathedral.—Your handwriting is creditable, and your suggestions shall have our best consideration.

W. C.—The "Hand-book of the Civil Service" contains the information you require, and will be forwarded to you on receipt of thirteen stamps.

V. Z. W.—We believe you would be expected to refund the money, but the best plan is to write to the Civil Service Commissioners.

Excelsior.—Both Latin and Greek lessons are given in the Popular Educator, being expressly prepared for self-instructing students. Lessons in Mathematics are also given. Hebrew is not included, and to qualify yourself for holy orders a knowledge of this language is not always essential: it depends on the diocese.

James.—Our hours of social intercourse, if well employed, may prove the seasons both of seed-time and harvest. It would be well every evening to reflect on the conversation of the day; to note any valuable suggestion or remark, and to "take stock," as it were, of our inner selves. The practice of keeping a note-book is, in our opinion, very useful. A diary will be found very profitable and interesting. Most persons are careful to look after their money; surely, then, we should be more exact with our time—how we spend it, what we get for it—time which is far more precious than money.

T. F. W.—The lines are Scott's:—

> "Breathes there a man with soul so dead,
> Who never to himself hath said,
> 'This is my own, my native land?'
> Whose heart hath ne'er within him burned,
> As home his footsteps he hath turned,
> From wandering on a foreign strand!"

The other quotation is from Wordsworth:—

> "I travelled among unknown men,
> In lands beyond the sea;
> Nor, England! did I know till then
> What love I bore to thee.
>
> "'Tis past, that melancholy dream!
> Nor will I quit thy shore
> A second time, for still I seem
> To love thee more and more."

A Sufferer.—You must be very cautious how you use your eyes; do not study, if you can help it, by artificial light. To wash the eyes frequently in cold water is an excellent means of giving them strength. But it is a bad practice to open them in cold water, as some persons do, as it often does injury by abstracting too much heat from the eyes, and occasioning irritability and weakness. It is a far better way to wash them simply with the hand. The dipping of the closed eyes in a full basin of water is very beneficial. There are, however, states of the eyes in which the application of cold water is highly improper, and warm or tepid water would be more appropriate. An ignorant use of it might, therefore, in some cases, prove injurious rather than useful. But to the healthy eye cold water is always serviceable. Those who have weak eyes, a peculiar disposition to close the lids, a difficulty afterwards of opening them; also an involuntary contraction of the lids, occasioning a sense of pressure in the eye-balls, with a feeling of heat, itching, and irritability, will find warm water produce more grateful sensations than cold, and do more good. A simple rule may here preserve from all error: If the effects following the application are grateful and pleasant, all is well; if they are otherwise, the application will prove injurious.

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ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LXIX.

(*Continued from page* 242.)

DYNAMICAL ELECTRICITY.

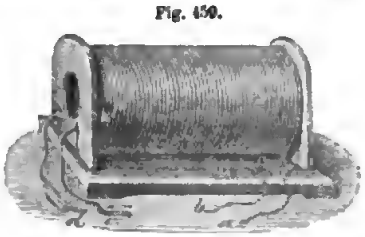
PHENOMENA OF INDUCTION.

Induction by Currents.—We owe our knowledge of this subject chiefly to the able researches of our illustrious countryman, Professor Faraday, who undertook them in the hope of obtaining electricity from ordinary magnetism, and under the influence of the consideration, that whether we adopt the beautiful theory of M. Ampère or another, or make any mental restriction whatever, it seems very extraordinary that as every electrical current is accompanied by a corresponding intensity of magnetic action at right angles to the current, good conductors of electricity, when placed within the sphere of this action, should not have a current induced through them, or some sensible effect produced, equivalent in force to such a current. That his labours resulted in success, is not only a fact of importance in the history of electrical science, but also one which strikingly illustrates the utility of physical theories in suggesting and directing experimental inquiries.

Professor Faraday has given the name of *currents of induction*, or *induced currents*, to instantaneous currents which are developed in metallic conductors under the influence of powerful magnets, or even that of the magnetic action of the earth.

The induction produced by currents is established by means of a bobbin with two wires. This is a cylinder of pasteboard or wood, round which are wrapped, first a thick copper wire, and then a thinner one, both covered with silk, fig. 459. They

Fig. 459.



are wrapped round contiguously, so as to form concentric and parallel electro-dynamical helixes, the spires of which are close together, but not in metallic contact. The two ends of the wire, *a* and *b*, being connected with the extremities of the wire of a galvanometer, a voltaic current is passed along the thick wire *c d*, which is called the inductor. The following phenomena then take place:—

1. At the moment when the wire *c d* begins to be traversed by a current from *c* towards *d*, for example, the deflection of the needle of the galvanometer indicates an inverse current—*i.e.* a current in a contrary direction to the former—in the wire *a b*, and one which is produced for a very short time only, for the needle immediately returns to the zero point, and remains there as long as the inducing current passes through the wire *c d*.

2. At the moment when—the communications being broken off—the wire *c d* ceases to be traversed by a current, there is again produced in the wire *a b* an induced current, instantaneous like the former, but *direct*, *i.e.* in the same direction as the inducing current.

Matteucci's Apparatus.—Fig. 460 represents an apparatus invented by M. Matteucci, and constructed by M. Ruhmkorff of Paris, for the purpose of exhibiting the development of currents produced by induction, whether by the discharge of a Leyden jar or the passage of a voltaic current.

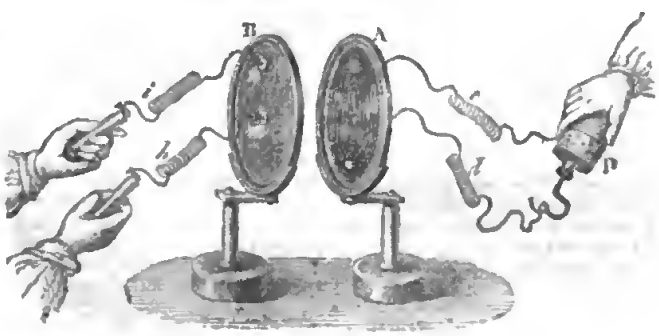
This apparatus consists of two glass plates about a foot in diameter, fixed vertically in two brass frames, A and B. These plates rest upon moveable supports, and are capable of being brought near each other, or removed away from each other, as may be desired. On the front side of the plate A is wound a copper wire, about one-twelfth of an inch in diameter, in a spiral form. The two ends of this wire pass through the plate, one at the centre and the other at the upper part, and terminate in small holders, like those represented at *m* and *n*, on the plate B. In these holders are placed two copper wires *c* and *d*, covered with silk, which are intended to receive the inducing current. On the side of the plate B which faces the plate A, is wound, also in a spiral form, a copper wire, not quite so thick as the wire C. Its extremities terminate in the holders *m* and *n*, which receive two wires *h* and *i*, intended to transmit the induced current. The two wires wound on the surfaces of the plates A and B are not only covered with silk, but each coil is isolated from the next by a thick layer of gum-lac varnish, an indispensable condition for experimenting with the electricity of electrical machines, which is always more difficult to isolate than that of batteries.

To show the production of the induced current by the discharge of a Leyden jar, bring one end *c* of the wire into connection with the external armature of the jar, and the other with the hook. Directly the spark appears, as the electricity which passes along the wire C acts by influence on the neutral fluid of the wire wound on the plate B, an instantaneous current arises in the wire. In fact, a person who holds in his hands two copper cylinders connected with the wires *i* and *h*, receives a shock, the intensity of which is greater in proportion as the plates are nearer. This experiment proves that the electricity of electrical machines is capable of giving rise to currents of induction, as well as that of the voltaic pile.

M. Matteucci's apparatus also serves to demonstrate the production of induced currents by the influence of voltaic currents. For this purpose, pass the current of a battery along the inducing wire C, and at the same time connect the two wires *i* and *h* with a galvanometer. Then, at the moment when the inducing current begins or ends, the same phenomena are observed as with the bobbin (fig. 459) already described, and the needle of the multiplier is more deflected in proportion as the two plates A and B are nearer each other.

Induction by Magnets.—We have seen that the influence of a current magnetises a bar of steel; reciprocally, a magnet is capable of producing currents of induction in metallic circuits.

Fig. 460.



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Mr. Faraday has demonstrated this by means of a bobbin with a single wire from six hundred to nine hundred feet in length. The two ends of the wire being connected with a galvanometer, a strongly-magnetised bar is suddenly put inside the bobbin, which is hollow, and the following phenomena are observed:—

1. At the moment when the bar is introduced, the galvanometer indicates an instantaneous induced current in the wire, the inverse of that which exists about the bar, comparing the bar to a dynamical cylinder, as is done in the theory of Ampère.

2. Directly the bar is removed, the needle of the galvanometer, which was brought back to zero, indicates a direct induced current.

We may also establish the inductive influence of magnets by the following experiment:—Place a bar of soft iron in the single wire bobbin, and bring a strong magnet suddenly near it; the needle of the galvanometer is then deflected, returns to zero directly the magnet is fixed, and is deflected in the contrary direction on its removal. The induction is here produced by the magnetisation of the soft iron under the influence of the magnetised bar.

The same effects of induction are obtained in the wire of an electro-magnet by turning a strongly-magnetised bar rapidly round in front of the ends of the electro-magnet, in such a manner that its poles act successively by influence on the two branches of the electro-magnet; or by forming two bobbins round a horse-shoe magnet, and passing a plate of soft iron rapidly before the poles of the magnet. The soft iron, being magnetised by influence, re-acts upon the magnet, and induced currents are successively produced in the wire in contrary directions.

Induction by Magnets in Bodies in Motion.—M. Arago, in 1824, first observed that the number of oscillations made by a needle in equal times, when it is deflected from its position of equilibrium, is very much weakened by the proximity of certain metallic substances, and particularly red copper, which is capable of reducing the number of oscillations from 300 to 4. This observation led the same philosopher, in 1825, to a fact not less unexpected, that of the tendency of a copper plate in motion to make a magnetised needle revolve.

To establish this phenomenon, arrange a moveable metallic disc on a vertical axis, and cover this disc with a glass bell, in which a magnetised needle is suspended by means of a fine thread. The needle must be separated from the disc by a thin membrane, in order that the motion of the air may not be transmitted within the bell. If the disc is subjected to a slow and uniform motion, the needle is deflected in the direction of the motion, and stops at twenty or thirty degrees from the magnetic meridian, according to the rapidity of the rotation of the disc. But if this rapidity increases, the needle is at last deflected more than ninety degrees; it is then carried along, describes an entire revolution, and follows the motion of the disc till it stops.

The effect decreases with the distance of the needle from the disc, and varies very much with the nature of the disc. The greatest effect takes place with metals; with wood, glass, water, etc., it is nothing. Mr. Babbage and Sir John Herschel have found that, representing the action of a magnet on a copper disc by 100, that upon other metals is represented by the following numbers: zinc, 95; tin, 46; lead, 25; antimony, 9; bismuth, 2. Lastly, the effect is greatly weakened if there are breaks of continuity in the disc, especially in the direction of its radii; but the same philosophers have shown that it perceptibly regains the same intensity, if the breaks are united by means of any metal whatever.

M. Arago gave no explanation of these phenomena. It was Mr. Faraday who, in 1832, first showed, by means of the galvanometer, that they were owing to currents of induction developed in the discs by the influence of the magnetised needle. The same philosopher maintains, that the magnetic action of the earth produces similar electric currents in metallic discs in motion, so that we may say that all metals in motion on the surface of the globe are traversed by currents of induction.

Since then, the phenomena of induction produced by the action of metals in motion have been studied by several philosophers both in France and in America. In making their experiments, they have employed the machine of Mr. Page, an American philosopher.

This machine consists of a strong horse-shoe magnet, before the poles of which a rectangular plate turns about an axis parallel to the two branches of the magnet, and equally distant from both. These branches are surrounded with two bobbins of long wire, the ends of which are connected with a delicate galvanometer, at a sufficient distance to be withdrawn from the action of the magnet.

With revolving plates formed of magnetic or diamagnetic metals the galvanometer always indicates the formation of induced currents of more or less intensity. According to M. Verdet, the observed differences depend solely upon the conductibility of the metals, and not at all upon their diamagnetic power, as some philosophers have supposed.

The Induction of a Current upon itself.—When the wire along which a voltaic current passes is wound about itself like a helix, it is observed that the spirals of the helix react upon one another, so as to communicate more intensity to the current. In fact, with a Bunsen battery of several couples, for example, nothing but a scarcely perceptible spark is obtained either by closing or opening a current, if the wire which connects the two poles is short and not wound. Further, on forming part of the circuit by holding an electrode in each hand, you feel no shock at all. On the contrary, if the wire is long and wound many times round itself, so as to form a thick bobbin, the spark dwindles to nothing on closing the current, but acquires considerable intensity on opening the current; and if you form part of the circuit you feel a shock, which is more violent in proportion as the contact is more completely established with the hands.

Mr. Faraday has shown, by means of the galvanometer, that these phenomena are owing to an instantaneous current, called an *extra current*, which is produced in the wire connecting the two poles at the moment when the connection is broken, and in the same direction as the principal current. M. Abria, who has made many experiments on currents of induction, found that the intensity of the extra current is equal to about ·72 of that of the principal current.

The effects described above acquire still greater intensity if you introduce a bar of soft iron within the bobbin, or, which comes to the same thing, if you pass the current through the bobbins of an electro-magnet. This also is a phenomenon owing to the reaction of soft iron when its magnetisation ceases.

Induced Currents of Different Orders.—In spite of their being instantaneous, induced currents may themselves, by their influence upon closed circuits, give rise to fresh induced currents, these again to others, and so on, in such a manner as to produce *induced currents of different orders.*

These currents, which were discovered by Professor Henry, of New Jersey, are established by making a series of bobbins—each formed of a copper wire covered with silk, and wound round itself in a spiral in the same plane, like that represented on plate A in fig. 460—act one upon the other. It is observed that the currents then produced in the bobbins are alternately in contrary directions, and that their intensity decreases in proportion as they are of a higher order.

APPARATUS FOUNDED UPON CURRENTS OF INDUCTION.

Clarke's Apparatus.—Mr. Clarke, of London, has constructed an apparatus, by means of which all the effects of currents of magnetic induction are produced. This apparatus consists of a very powerful collection of horse-shoe magnets, fig. 461, fastened vertically to a piece of wood. In front of these magnets is an electro-magnet B B, moveable about a horizontal axis. Its bobbins are formed upon two soft iron cylinders, bound at one end by a plate V of soft iron, and at the other by a similar plate of brass. These two plates are fastened to a copper axis, terminated at one extremity by a cylinder q i, and at the other by a pulley, to which motion is communicated by means of a leather strap passing round a large wheel R.

Each bobbin is formed of a very thin copper wire, covered with silk and making as many as 1,500 turns. One end of the wire of the bobbin B joins, on the axis of rotation, an end of the wire of the bobbin B', and the two other ends terminate in a copper ferule q, which is fastened to the axis, but isolated

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from it by a cylindrical ivory envelope. Care must be taken that the currents induced in the ends which join, be in the same direction, which is effected by winding the wires upon the two bobbins in contrary directions.

When the electro-magnet is turned, its two branches are magnetised under the influence of the magnet A alternately in contrary directions, and in each wire a current is induced which changes its direction every semi-revolution. To follow these currents in their progress, it is necessary to remember that the two ends of the wire which terminate at the ferule q give a current in the same direction, and it is the same with those which join on the axis. Now in front of the ferule q there is a second ferule o, formed of two equal pieces, isolated from one another, but one connected with q and the other with the axis. It follows from this, that during the revolution of the electro-magnet, each half of the ferule o represents a pole which changes its sign at each half revolution. From the two pieces o the current passes on to two strips of brass b and c, fastened to two copper plates r and n. By this arrangement, the current in each strip b and c is constantly in the same direction. In fact, the strip c, for example, touches the two pieces o successively; it is therefore successively in communication with the axis and with q, and consequently with two ends of the wires and then with the two others. But the wires being wound in a contrary direction, when the bobbin n' takes the place of n, the current of the ferule q, as well as that of the axis, changes its sign; consequently, the same takes place with each half of the ferule o, and as the strip c now touches a different half from what it touched at first, it must be traversed by a current in the same direction.

With the two strips b and c alone, the two contrary currents which proceed from the two pieces o could not unite; but this is accomplished by means of a third strip a and two appendages i, only one of which is visible in the figure. These two appendages are isolated from each other on an ivory cylinder, but are respectively connected with the pieces o. Every time the strip a touches one of these appendages, it is in communication with the strip b, and the current is closed, for it passes from b to a, then reaches the strip c through the plate n. On the contrary, as long as the strip a does not touch one of the appendages, the current is broken.

At the moment when the current is interrupted, violent shocks may be obtained. For this purpose, fasten at n and r two long copper wires, coiled in a helix and terminating in two cylinders p and p' held in the hands. Then every time the current is interrupted, an instantaneous extra-current is produced in the circuit formed by the wires np, rp', and by the body, and this extra-current gives a violent shock, which is

Fig. 463.



renewed at each half revolution of the electro-magnet, and its intensity increases with the velocity of the rotation. Further, the muscles contract with such force that the will has no power over them, and you cannot open your hands. With an apparatus well constructed and of large dimensions, it is impossible to bear the duration of the shock; whoever attempts to persist is thrown down, rolls on the ground, and is soon overcome by the painful sensation.

Fig. 461.

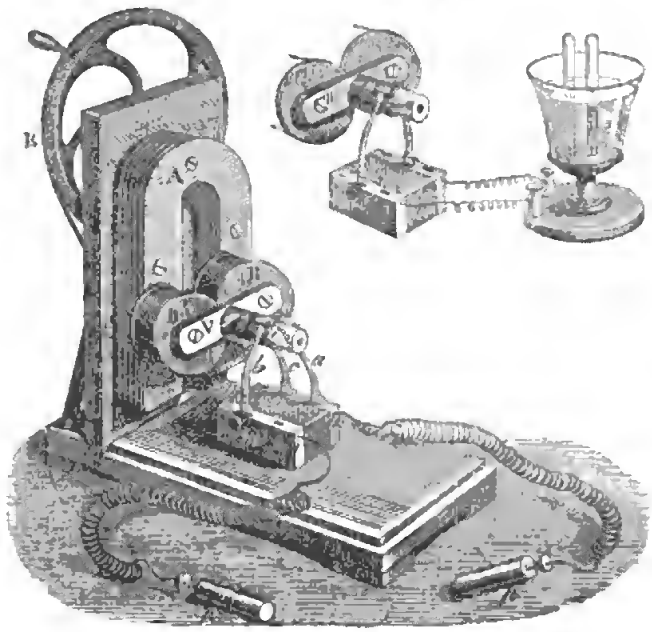
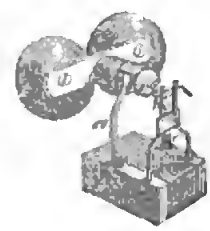


Fig. 462.

With Clarke's apparatus, all the effects of voltaic currents may be produced in currents of induction. Fig. 462 shows

Fig. 464.



how to arrange an experiment for the decomposition of water. The strip a is then suppressed, the current being closed by the

liquid in which the two wires representing the electrodes are placed.

For physiological and chemical effects, the wire wound round the bobbins is fine, and about 1,700 to 2,000 feet upon each. For physical effects, on the contrary, the wire is thick, and about 80 or 100 feet on each bobbin. Figs. 463 and 464 show the shapes of the bobbins. The former represents the inflammation of ether, and the second the incandescence of a metallic wire *e*, along which passes—always in the same direction—the current going from the strip *a* to the strip *c*.

LESSONS IN MORAL SCIENCE—No. XII.

DUTIES OF MAN TO THE CREATOR AS THUS MANIFESTED.

Having given, in a summary, the proofs of the existence and character of God, so far as reason can guide us in the inquiry, we are now prepared to consider the relation in which man stands to God, and the obligations which arise out of this relation. As man himself, in the wise and wonderful constitution of his mind and body, has been supplied with the most striking and convincing evidences of a powerful, wise, and beneficent Author of the universe; we are led at once to see, that God, as being the Creator of men, and the Giver of all his remarkable endowments, has a perfect right to claim his obedience to the utmost extent of his powers. And on taking an impartial survey of the origin of his being, of the goodness of the Creator in his various beneficent endowments, and of his continual dependence upon divine Providence, not only for the continuance of his being, faculties, and susceptibilities, but also for all those gifts necessary to his health and comfort, man cannot but feel that he is under the strongest moral obligation to obey, honour, and glorify his Maker, with his best affections and most strenuous exertions. This is the foundation of what is called the law—that moral law which is, as it were, written on the heart of every man; for what man is there, who has come to the exercise of reason, who does not perceive a clear distinction between right and wrong? And where can be found a human being, who, upon having his relation to God as his Creator set before him, does not feel in his conscience, that he is under a moral obligation to be subservient to his will?

The general obligation on all moral agents, to serve their Creator, is evident enough. It will require some time, and careful consideration of this relation in which man stands to his Maker, to ascertain the particular duties which are obligatory on all men.

This we shall now attempt so far as reason can guide us in this matter.

Here it may be proper to remark, that the essence of all obedience is internal; that is, consists in the dispositions, affections and purposes of the heart. Outward actions partake of a moral nature only so far as they proceed from these internal affections. Human laws must be satisfied with external obedience, because human lawgivers cannot search the heart, nor scrutinise the motives of those who owe obedience. But even earthly judges, in administering justice, endeavour, as far as human judgment can go, to discover from what internal motives any action under examination was performed; and their decision of acquittal or condemnation is grounded on the opinion which they form of the intention and motives of the person under arraignment. Much more, then, does the moral Governor of the World require of his creatures the obedience of the heart; for he possesses a perfect knowledge of what is in the heart of every one; and a most perfect estimate of the nature of moral good and evil, as those qualities exist in the human heart. It seems evident, therefore, that the laws of nature demand the highest degree of excellence of which the mind of man is capable. And as God possesses every moral attribute in the highest perfection, it is reasonable to infer, that man, as he came from the hands of his Creator, was endued with the seeds and principles of every moral virtue. And if the nature of man is not now found adorned with these moral excellencies, he must in the exercise of his free will have departed from his primeval state. Our present inquiry, however, is not whether man has fallen from his original integrity, but what are the duties arising out of man's relation to God as his Creator, Benefactor, and Preserver. Although the obligation to obedience arises primarily from the relations just mentioned, yet it is necessary to take into view the supreme excellence and majesty of the character of God; for if pious and devout sentiments towards God be required, it is because there is in the character of God, as exhibited in his works, something to call forth such affections from rational and rightly disposed minds. If God were not supremely excellent, it would not be reasonable to demand supreme love from his creatures, and so of other things. But as we know that God is possessed of every excellence in an infinite degree, there exists an object for every affection and sentiment towards him of which the human mind is capable. From what has been said it is evident, that in order to perform any other duties to the Creator, some knowledge of his true character is requisite. Without knowledge the rational mind cannot exercise right affections.

Supposing, then, a rational mind, such as it is reasonable to think man possessed when he proceeded from the hands of his Maker, and possessing that knowledge of his attributes which may be learnt from his works, what would be the first thoughts and feelings of the newly-created soul? In our judgment, the first feeling would be an emotion of profound veneration, or perhaps the word *adoration* would more strongly indicate the state of the mind, absorbed in the contemplation of a Being so august, so powerful, and so immense. This feeling, then, is one which ought to exist in every rational mind towards the Almighty. This is the true foundation of divine worship. It is the deep and solemn emotion which is the essence of the worship, which holy beings in all worlds offer unto God.

And this feeling would lead to a reverence for every thing which has any relation to God. His very name would be sacred. We have read of men of great eminence who never mentioned that name without a solemn pause, or some external token of reverence.

The duty which most naturally arises from the relation which men sustain to God, as his Creator, Benefactor, and Redeemer, is that of gratitude. This is, when strong, a very lively and impulsive feeling. It draws men along as taken captive; and yet the constraint is not painful, but pleasing. Under the influence of gratitude, men will engage in the most odious duties, and will voluntarily make the most self-denying sacrifices. Under the influence of this affection men have been willing to lay down their lives. Gratitude is, then, an important principle of man's obedience. It is true, some have attempted to degrade this principle as one which scarcely can be said to partake of the nature of virtue, because it has respect to self, and to our own interest. But though gratitude originates in the sense of benefits received by ourselves, it does not deserve to be classed with mere selfish affections. Its object is to make a return to a benefactor for favours received. It is, therefore, an elevated species of justice; for when a suitable and adequate return can be made for favours received, gratitude will not be satisfied until this is done. And in regard to the benefits received from our Creator, as an adequate compensation is utterly beyond our power, gratitude manifests itself in acknowledgment of obligation in thanksgiving and in unceasing praises. There is, however, no necessity to argue this matter; the appeal may safely be made to the feelings of every rightly constituted mind. All men who acknowledge the existence and providence of God, feel that a debt of gratitude is due to their great Benefactor.

As the mind, when uncorrupted, is so constituted as to love and esteem whatever is excellent, and as moral excellence is superior to all other amiable objects, and as God possesses this excellence in an infinite degree, it is reasonable that he should be esteemed above every other object. Finite minds, it is true, can never exercise love proportionate to the excellence of this Glorious Being; but as far as they possess the capacity of apprehending it, and the susceptibility of affection, they are under moral obligation to love God with all their powers. And this cannot be considered as demanding too much of the rational creature, for no other measure of affection can be fixed without supposing a wrong estimate of the object, or a defect of right feeling; for what is more reasonable than to proportion the intensity of our affection to the excellence of

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the object? But in this, also, the excellency of the object infinitely surpasses our capacity of love, so that if the mind should be enlarged a thousand-fold, so as to possess a thousand times as great a power of love and esteem as at present, the obligation to love God with this increasing capacity would be complete; and any less degree of esteem and care would be casting dishonour on God. And again, this obligation would exist, even if it were painful to come up in our affections to this high demand; but this is so far from being the fact, that man's happiness is perfect in the same proportion as his obedience is perfect. From every consideration, therefore, it is evident that man is bound by the law of his nature, and the relation which he sustains to God, to love him with his whole soul.

As the will of God is always guided by wisdom and goodness, whenever and however this will is manifested, it should be implicitly and cheerfully submitted to, even though contrary to our wishes, and even what seems best to our reason; which is submission to the providence of God.

Another duty clearly incumbent on the rational creature of God, is trust or confidence. As man is dependent, and as the supply of his necessities can be derived from no other source than from God, it is evidently his duty to place his confidence in God for every thing, believing in his goodness, faithfulness and power.

This trust in God, however, involves the duty of prayer. It is as natural and reasonable for a dependent creature to apply to its Creator for what he needs as for a child thus to solicit the aid of a parent, who is believed to have the disposition and ability to bestow what it needs. Plausible objections have been raised against the duty of prayer, derived from the omniscience of God, and from his immutable purposes. But these objections possess no real validity. For although God knows perfectly well beforehand what his creatures need, yet the acknowledgment of their dependence is manifestly proper, and the offering of petitions for such things as they need has a tendency to keep up a proper sense of dependence. And as God deals with his creatures according to the nature which he has given them, it is proper that he should require of them such dispositions and acts as are becoming in dependent creatures. This, too, is in accordance with the conduct of men on whom others are dependent. The object of prayer, including praise, is to preserve in the mind a right state of feeling towards a Being to whom it owes every thing, and from whom alone blessings can be expected. The highest privilege of the most exalted creature is to enjoy communion and intercourse with the Infinite Source of all good. Prayer is the only means which man enjoys of holding immediate intercourse with his Maker. And this privilege is the highest honour which he can enjoy in the present state. So, also, it is a means of the most sublime happiness. By this exercise he draws near to God, and when such approaches are made sincerely and affectionately on his part, it cannot be doubted that Divine communications will be vouchsafed, and the light of the Divine favour be lifted upon him, and the answer to his prayers granted by the dispensations of divine Providence toward him.

As to the objection derived from the immutability of the Divine purposes, it arises from a narrow view of this subject, which leaves out an important part of the Divine plan. The purposes of God, though immutable, are not inconsistent with the freedom of his creatures, nor with the use and efficacy of appropriate means. The truth is, all these acts and means are included in the Divine plan. If God has decreed that a certain field shall produce a plentiful crop, he has also decreed that all the influences of sun, rain, and the necessary labour shall take place. And if he has purposed to bestow certain favours on his rational creatures, he may in the same manner purpose that these benefits shall be given in answer to prayer; so that prayer may be considered as the means by which these blessings are obtained, as truly as a plentiful crop is the effect of a skilful and laborious tillage of the ground.

As to external acts of devotion, reason and nature teach that humility and reverence in our words, attitudes and gestures are highly proper when we address our praises unto God. When we are filled with devotional feelings, nature prompts us to give utterance to our emotions; and the use of appropriate sounds and gestures seems also to keep up and increase the feelings of the mind. These outward expressions, however, are not essential to acceptable prayer. The silent breathings of desire are known to God, and will be acceptable to him. It is reasonable to believe that God never takes more complacency in his creatures, than when they come before him in the humble, reverential posture of adoration, prayer and praise.

Nothing can be more evident, than that the creature should exercise benevolence or good will towards the Author of his being. Not that we can desire Him to be more excellent, more wise, more powerful, or more independent than he is; but we may rejoice in all his attributes and glory in his greatness, and be delighted with the idea of his unbounded and uninterrupted happiness; and in these elevated emotions of joy, and acts of glorying and glorifying God, it is believed that the purest, sublimest, and most constant happiness of all holy beings consists. Nothing is more evident to impartial reason, than that the glory of God should be the supreme object of the rational creature's pursuit. It is, in fact, the noblest object which can be considered. We are unable to imagine any thing more glorious for God himself to seek, than his own glory. Certainly, then, it is the highest end at which any creature can aim; and it is a sentiment entirely accordant with reason, that all the creation was produced for the purpose of exhibiting the glory of God, and man was endowed with a capacity of knowing and loving God for the very purpose of glorifying his Maker. Not that any addition can be made to the essential perfection and felicity of the Eternal One; but the manifestation of these perfections is what is properly called the glory of God.

All the duties which have been specified commend themselves, to every impartial mind, as obligatory on rational creatures; all that seems further necessary is to give a brief summary of what has been said on this subject.

The order in which these devotional exercises are set down is not very important; for though there is an order of precedence and sequence in all our mental exercises, yet while it is unnecessary to speak of those affections which have God for their object *seriatim*, they are commonly combined and mingled in the conscious experience of the mind; so that in the same moment various acts and exercises appear to be simultaneous. They may, however, be all comprehended under the single term, *Love*, if we give a genuine meaning to that term.

The summation which seems as proper as any other that suggests itself is the following:—

1. *Adoration*, having for its object the greatness, majesty, holiness, and incomprehensibility of God.

2. *Admiration*, or holy wonder of the wisdom of God in the multiplied contrivances and organisations in the created universe.

3. *Esteem for and complacency in God's moral excellence.*

4. *Desire of Union and Communion with God*, and of conformity to his character.

5. *Gratitude* for his goodness manifested in all creation; but particularly to man, in the constitution of his soul and body, and in the provision made by the providence of God for the subsistence and comfort of the human family, and of all living creatures.

6. *Trust, or Confidence in God*, as a benignant and kind Father and protector, who will not abandon the work of his own hands, nor be wanting in contributing to their happiness in future, as long as they are obedient to his will.

7. *Acquiescence in the will of God*, and submission to those dispensations which even cross the natural feelings, is an evident moral duty. Indeed, the surrender of soul and body to God, to be used and disposed of by him for his own glory, is the state of mind of which the moral faculty approves.

8. *Prayer to God* for such things as we need, is a duty dictated by the law of nature, including suitable expressions of our devotional feelings in words and gestures. But no creature has a right to institute or adopt any ceremonies of worship which God has not appointed.

9. *Making the Glory of God the supreme end of all his actions*, the object of his constant and untiring pursuit; and rejoicing and triumphing in the infinite glory, independence, immutability, and blessedness of God.

The above enumeration, it is believed, comprehends the internal acts and exercises in which the duty of man to God consists, which duties plainly arise out of the attributes of God and man's relation to him, as his Creator, Preserver, and

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Benefactor. And if man had never failed in the performance of these duties—if he had continued to exercise those affections which spontaneously spring up in his soul, when he came from the hands of his Creator, this world, instead of being a land of misery, would now have been a blooming paradise of joy. And we may be sure that a good God, who loves all his creatures according to their actions, would never have permitted the natural evils which now oppress the human soul to have entered into the world. Sickness, famine, and death in its thousand different forms, would have been unknown.

It is evident from the slightest view of the character of man in all ages and countries, that he has lost his primeval integrity, that the whole race have by some means fallen into the dark gulf of sin and misery. This, reason teaches; but how to escape from this wretched condition, she does not teach.

BIOGRAPHY.—No. XX.

GIBBON.

By J. R. Beard, D.D.

Edward Gibbon, the last of England's historical triumvirate, was born on the 8th of May, 1737, at Putney in Surrey. Of a tender frame, he owed his preservation and his subsequent health to the delicate, thoughtful, loving and constant care of a good aunt. Studying in the Westminster School and the University of Oxford, Gibbon laid in an ample store of sound scholarship, and so prepared the way for his classical work, the "History of the Decline and Fall of the Roman Empire," in which he has exhausted as well as adorned every direct and collateral topic connected with his grand and imposing subject. In a very charming composition, entitled "Memoirs of my Life and Writings," Gibbon himself has given some particulars respecting his great production, which, as being specially interesting and instructive, we shall transcribe, running them together. "My temper is not very susceptible of enthusiasm, and the enthusiasm which I do not feel I have ever scorned to affect; but at the distance of twenty-five years I can neither forget nor express the strong emotions which agitated my mind as I approached and entered the eternal city, after a sleepless night, and trod with a lofty step the ruins of the Forum; each memorable spot where Romulus stood or Tully spoke or Cæsar fell, was at once present to my eye; and several days of intoxication were lost or enjoyed before I could descend to a cool and minute investigation. It was at Rome, on the 15th of October, 1764, as I sat musing amidst the ruins of the Capitol, while the bare-footed friars were singing Vespers in the Temple of Jupiter, that the idea of writing the decline and fall of the city first started to my mind. But my original plan was circumscribed to the decay of the city rather than of the empire, and though my reading and reflections began to point towards that object, some years elapsed, and several evocations intervened, before I was seriously engaged in the execution of that laborious work. I began gradually to advance from the wish to the hope, from the hope to the design, from the design to the execution of my historical work, of whose limits and extent I had yet a very inadequate notion. The classics as low as Tacitus, the younger Pliny and Juvenal were my old and familiar companions. I reviewed again and again the immortal works of the French and English, the Latin and Italian classics. My Greek studies maintained and extended my knowledge of that incomparable idiom. Homer and Xenophon were still my favourite authors. I insensibly plunged into the ocean of the Augustan History, and in the descending series I investigated, with my pen almost always in my hand, the original records, both Greek and Latin, from Dion Cassius to Ammianus Marcellinus, from the reign of Trajan to the last of the Western Cæsars. The subsidiary rays of medals and inscriptions, of geography and chronology, were thrown on their proper objects; and I applied the collections of Tillemont, whose inimitable accuracy almost assumes the character of genius, to fix and arrange within my reach the loose and scattered atoms of historical information. Through the darkness of the middle ages I explored my way in the "Annals and Antiquities of Italy" of the learned Muratori, and diligently compared them with the parallel or transverse lines of Sigonius and Maffei, Baronius and Pagi, till I almost grasped the ruins of Rome in the fourteenth century, without suspecting that this final chapter must be attained by the labour of six quartoes and twenty years. Among the books which I purchased, the Theodosian Code, with the commentary of James Godefroy, must be gratefully remembered. The Jewish and Heathen Testimonies, as they are collected and illustrated by Dr. Lardner, directed without superseding my search of the originals. No sooner was I settled in my house and library (in London), than I undertook the composition of the first volume of my history. At the outset all was dark and doubtful, even the title of the work, the true æra of the decline and fall of the Roman empire, the limits of the introduction, the division of the chapters and the order of the narrative; and I was often tempted to cast away the labour of seven years. The style of an author should be the image of his mind, but the choice and command of language is the fruit of exercise. Many experiments were made before I could hit the middle tone between a dull chronicle and a rhetorical declamation; three times did I compose the first chapter, and twice the second and third, before I was tolerably satisfied with their effect. In the remainder of the way I advanced with a more equal and easy pace.

"The first volume was now ready for the press. After the perilous adventure had been declined by my friend, Mr. Elmsley, I agreed upon easy terms with Mr. Thomas Cadell, a respectable bookseller, and Mr. William Strahan, an eminent printer; and they undertook the care and risk of the publication, which derived more credit from the name of the shop than from that of the author. The last revisal of the proofs was submitted to my vigilance, and many blemishes of style, which had been invisible in the manuscript, were discovered and corrected in the printed sheet. So moderate were our hopes, that the original impression had been stinted to 500, till the number was doubled by the prophetic taste of Mr. Strahan. During this awful interval I was neither elated by the ambition of fame, nor depressed by the apprehension of contempt. My diligence and accuracy were attested by my own conscience. History is the most popular species of writing, since it can adapt itself to the highest or the lowest capacity. I had chosen an illustrious subject. Rome is familiar to the schoolboy and the statesman, and my narrative was deduced from the last period of classical reading. I am at a loss how to describe the success of the work without betraying the vanity of the writer. The first impression was exhausted in a few days; a second and a third edition were scarcely adequate to the demand. My book was on every table and almost on every toilette; the historian was crowned by the taste or fashion of the day; nor was the general voice disturbed by the barking of any profane critic. The style of the first volume is, in my opinion, somewhat crude and elaborate; in the second and third it is ripened into ease, correctness and numbers; but in the three last I may have been seduced by the facility of my pen, and the constant habit of speaking one language and writing another may have infused some mixture of Gallic idioms. Happily for my eyes, I have always closed my studies with the day, and commonly with the morning; and a long but temperate labour has been accomplished without fatiguing either the mind or body. I have presumed to mark the moment of conception; I shall now commemorate the hour of my final deliverance. It was on the day, or rather night, of the 27th of June, 1787, between the hours of eleven and twelve, that I wrote the last line of the last page, in a summer-house in my garden. After laying down my pen, I took several turns in a *berceau*, or covered walk of acacias, which commands a prospect of the country, the lake and the mountains. The air was temperate, the sky was serene, the silver orb of the moon was reflected from the waters, and all nature was silent. I will not dissemble the first emotions of joy on the recovery of my freedom, and perhaps the establishment of my fame. But my pride was soon humbled, and a sober melancholy was spread over my mind by the idea that I had taken an everlasting leave of an old and agreeable companion, and that whatsoever might be the future fate of my history, the life of the historian would be short and precarious. I will add two facts, which have seldom occurred in the composition of six or at least five quartoes: 1. My first rough manuscript, without any intermediate copy, has been sent to the press; 2 Not a sheet has been

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seen by any human eyes, excepting those of the author and the printer; the faults and the merits are exclusively my own."

Gibbon died at his dwelling, St. James's-street, London, on the 16th of January, 1794. We hope that these particulars, combined with the ensuing extracts, will lead some of our readers to the diligent perusal of the history which is the everlasting monument of his fame.

MAHOMET.

"According to the tradition of his companions, Mahomet was distinguished by the beauty of his person—an outward gift which is seldom despised, except by those to whom it has been refused. Before he spoke, the orator engaged on his side the affections of a public or a private audience. They applauded his commanding presence, his majestic aspect, his piercing eye, his gracious smile, his flowing beard, his countenance that painted every sensation of the soul, and his gestures that enforced each expression of the tongue. In the familiar offices of life he scrupulously adhered to the grave and ceremonious politeness of his country: his respectful attention to the rich and powerful was dignified by his condescension and affability to the poorest citizens of Mecca; the frankness of his manner concealed the artifice of his views; and the habits of courtesy were imputed to personal friendship or universal benevolence. His memory was capacious and retentive, his wit easy and social, his imagination sublime, his judgment clear, rapid and decisive. He possessed the courage both of thought and action; and although his designs might gradually expand with his success, the first idea which he entertained of his divine mission bears the stamp of an original and superior genius. The son of Abdallah was educated in the bosom of the noblest race, in the use of the purest dialect of Arabia; and the fluency of his speech was corrected and enhanced by the practice of discreet and reasonable silence. With these powers of eloquence, Mahomet was an illiterate barbarian; his youth had never been instructed in the arts of reading and writing; the common ignorance exempted him from shame or reproach, but he was reduced to a narrow circle of existence, and deprived of those faithful mirrors which reflect to our minds the minds of sages and heroes. Yet the book of nature and of man was open to his view; and some fancy has been indulged in the political and philosophical observations which are ascribed to the Arabian traveller. He compares the nations and religions of the earth; discovers the weakness of the Persian and Roman monarchies; beholds with pity and indignation the degeneracy of the times; and resolves to unite, under one God and one king, the invincible spirit and primitive virtues of the Arabs. Our more accurate inquiry will suggest, that instead of visiting the courts, the camps, the temples of the East, the two journeys of Mahomet into Syria were confined to the fairs of Bostra and Damascus; that he was only thirteen years of age when he accompanied the caravan of his uncle, and that his duty compelled him to return as soon as he had disposed of the merchandise of Cadijah. In these hasty and superficial excursions, the eye of genius might discern some objects invisible to his grosser companions; some seeds of knowledge might be cast upon a fruitful soil; but his ignorance of the Syriac language must have checked his curiosity; and I cannot perceive in the life or writings of Mahomet, that his prospect was far extended beyond the limits of the Arabian world. From every region of that solitary world the pilgrims of Mecca were annually assembled, by the calls of devotion and commerce: in the free concourse of multitudes, a simple citizen, in his native tongue, might study the political state and character of the tribes, the theory and practice of the Jews and Christians. Some useful strangers might be tempted or forced to implore the rites of hospitality; and the enemies of Mahomet have named the Jew, the Persian, and the Syrian monk, whom they accuse of lending their secret aid to the composition of the Koran. Conversation enriches the understanding, but solitude is the school of genius; and the uniformity of a work denotes the hand of a single artist. From his earliest youth Mahomet was addicted to religious contemplation: each year, during the month of Ramazan, he withdrew from the world and from the arms of Cadijah: in the cave of Hera, three miles from Mecca, he consulted the spirit of fraud for enthusiasm, whose abode is not in the heavens but in the mind of the prophet. The faith which, under the name of Islam, he preached to his family and nation, is compounded of an eternal truth and a necessary fiction—that there is only one God, and that Mahomet is the apostle of God."

THE RELIGION OF THE ANCIENT GERMANS.

"The religious system of the Germans (if the wild opinions of savages can deserve that name) was dictated by their wants, their fears and their ignorance. They adored the great visible objects and agents of nature, the sun and the moon, the fire and the earth; together with those imaginary deities who were supposed to preside over the most important occupations of human life. They were persuaded that, by some ridiculous arts of divination, they could discover the will of the superior beings, and that human sacrifices were the most precious and acceptable offering to their altars. Some applause has been hastily bestowed on the sublime notion entertained by that people of the Deity, whom they neither confined within the walls of a temple, nor represented by any human figure; but when we recollect that the Germans were unskilled in architecture, and totally unacquainted with the art of sculpture, we shall readily assign the true reason of a scruple, which arose not so much from a superiority of reason, as from a want of ingenuity. The only temples in Germany were dark and ancient groves, consecrated by the reverence of succeeding generations. Their secret gloom, the imagined residence of an invisible power, by presenting no distinct object of fear or worship, impressed the mind with a still deeper sense of religious horror; and the priests, rude and illiterate as they were, had been taught by experience the use of every artifice that could preserve and fortify impressions so well suited to their own interest.

"The same ignorance, which renders barbarians incapable of conceiving or embracing the useful restraints of laws, exposed them naked and unarmed to the blind terrors of superstition. The German priests, improving this favourable temper of their countrymen, had assumed a jurisdiction, even in temporal concerns, which the magistrate could not venture to exercise; and the haughty warrior patiently submitted to the lash of correction, when it was inflicted, not by any human power, but by the immediate order of the god of war. The defects of civil policy were sometimes supplied by the interposition of ecclesiastical authority. The latter was constantly exerted to maintain silence and decency in the popular assemblies; and was sometimes extended to a more enlarged concern for the national welfare. A solemn procession was occasionally celebrated in the present countries of Mecklinburgh and Pomerania. The unknown symbol of the *Earth*, covered with a thick veil, was placed on a carriage drawn by cows; and in this manner the goddess, whose common residence was in the island of Rugen, visited several adjacent tribes of her worshippers. During her progress the sound of war was hushed, quarrels were suspended, arms laid aside, and the restless Germans had an opportunity of tasting the blessings of peace and harmony. The *truce of God*, so often and so ineffectually proclaimed by the clergy of the eleventh century was an obvious imitation of this ancient custom.

"But the influence of religion was far more powerful to inflame, than to moderate, the fierce passions of the Germans. Interest and fanaticism often prompted its ministers to sanctify the most daring and the most unjust enterprises, by the approbation of Heaven and full assurances of success. The consecrated standards, long revered in the groves of superstition, were placed in the front of the battle; and the hostile army was devoted with dire execrations to the gods of war and of thunder. In the faith of soldiers (and such were the Germans) cowardice is the most unpardonable of sins. A brave man was the worthy favourite of their martial deities; the wretch who had lost his shield was alike banished from the religious and the civil assemblies of his countrymen. Some tribes of the north seem to have embraced the doctrine of transmigration, others imagined a gross paradise of immortal drunkenness. All agreed, that a life spent in arms, and a glorious death in battle, were the best preparations for a happy futurity, either in this or in another world."

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LESSONS IN ARITHMETIC.—No. XXXVII.

ANALYSIS.

The term *Analysis*, in physical science, signifies the *resolving* of a compound body into its *elements*, or *component parts*.

Analysis, in arithmetic, signifies the *resolving of numbers* into the *factors* of which they are composed, and the *tracing of the relations* which they bear to each other.

In the preceding lessons the student has become acquainted with the method of *analysing particular* examples and combinations of numbers, and thence deducing *general principles and rules*. But *analysis* may be applied with advantage not only to the *development* of mathematical truths, but also to the *solution* of a great variety of problems, both in arithmetic and practical life. Indeed, it is the method by which business men generally solve practical questions. A little practice will give the student great facility in its application.

No specific directions can be given for solving examples by *analysis*. None, in fact, are requisite. The *judgment*, from the conditions of the question, will *suggest the process*. Hence *Analysis* may, with propriety, be called the Common Sense Rule.

In solving questions analytically, it may be remarked in general, that we reason from the *given number* to 1, then from 1 to the *number required*.

Ex. 1. If 60 yards of cloth cost 240 crowns, what will 85 yards cost?

Analytic Solution.—Since 60 yds. cost 240 crowns, 1 yd. will cost $\frac{1}{60}$ of 240 crowns; and $\frac{1}{60}$ of 240 crowns is 4 crowns, or £1. Now, if 1 yd. costs 4 crowns, 85 yds. will cost 85 times as much; and 4 crowns × 85=340 crowns, or £85. *Ans.*

Or, we may reason thus: 85 yds. are $\frac{85}{60}$ of 60 yds.; therefore, 85 yds. will cost $\frac{85}{60}$ of 240 crowns (the cost of 60 yds.), and $\frac{85}{60}$ of 240 crowns is 240 crowns × $\frac{85}{60}$=340 crowns, or £85, the same as before.

Other solutions of this example might be given; but our present object is to show how this and similar questions may be solved by *analysis*. The former method is the simplest and most strictly analytic, though not so short as the latter. It contains two steps:

First, we separate the given price of 60 yds. (240 crowns) into 60 equal parts, to find the value of 1 part, or the cost of 1 yd., which is 4 crowns.

Second, we multiply the price of one yd. (4 crowns) by 85, the number of yds. whose cost is required, and the product is the answer sought.

This and similar questions are usually placed under the rule of *Simple Proportion*, or the *Rule of Three*.

The operation of solving a question by analysis, is called an *analytic solution*. In working the following examples, each one should be analysed, and the reason for every step given in full.

2. A man bought a horse, and paid £45 down, which was $\frac{5}{7}$ of the price of it: what did he give for the horse?

Analysis.—Since £45 is $\frac{5}{7}$ of the price, the question resolves itself into this: £45 is $\frac{5}{7}$ of what sum? If £45 is $\frac{5}{7}$ of a certain sum, $\frac{1}{7}$ is $\frac{1}{5}$ of £45; and $\frac{1}{5}$ of £45 is £9. Now, if £9 is 1 seventh, 7 sevenths are 7 times as much; and £9×7=£63. *Ans.* £63.

Proof.—$\frac{1}{7}$ of £63=£9, and 5 sevenths are 5 times as much, which is £45, the sum he paid down for the horse.

In solving examples of this kind, the learner is often perplexed in finding the value of $\frac{1}{7}$, etc. This difficulty arises from supposing that if $\frac{1}{7}$ of a certain number is 45, $\frac{1}{7}$ of it must be $\frac{1}{7}$ of 45. This mistake will be easily avoided by substituting in his mind the word *parts* for the given *denominator*. Thus, if 5 parts cost £45, 1 part will cost $\frac{1}{5}$ of £45, which is £9. But this part is a *seventh*. Now, if 1 seventh cost £9, then 7 sevenths will cost 7 times as much.

3. If 40 bales of wool cost £120, how much will 100 bales cost?

4. Bought 35 tons of hay for £70: how much will 16 tons cost?

5. What is the cost of 37 gallons of rum, at £21 a hogshead?

6. What is the cost of 1,600 pounds of rice, at £14 per ton?

7. What is the cost of 18 quarts of chestnuts, at 3 crowns a bushel?

8. If 55 tons of hemp cost £660, what will 220 tons cost at the same rate?

9. If 165 bushels of apples cost £32, how much will 31 bushels cost?

10. If 72 bushels of peas cost 253 crowns, what will a pint cost at the same rate?

11. If 150 acres of land cost £7,000, what will a square rood cost?

12. If 2 pipes of wine cost £315, what is that per gill?

13. A farmer bought a yoke of oxen, and paid £40 in ready money, which was $\frac{2}{3}$ of the cost: what did they cost?

14. Bought a house, and paid £630 in goods, which was $\frac{7}{12}$ of the price of it: what was the cost of the house?

15. A young man lost £256 by gambling, which was $\frac{8}{17}$ of all he was worth: how much was he worth?

16. A man having £1,500, paid $\frac{3}{5}$ of it for 112½ acres of land: how much did his land cost per acre?

17. If a stack of hay will keep 350 sheep 90 days, how long will it keep 525 sheep?

18. If 440 barrels, of flour will last 15 men 55 months, how long will the same quantity last 28 men?

19. If 136 men can build a warehouse in 120 days, how long will it take 15 men to build it?

20. If $\frac{3}{4}$ of a pound of tea cost 1s. 8d., what will $\frac{5}{8}$ of a pound cost?

21. If $\frac{3}{4}$ of a yard of broadcloth cost 8s. 6d., how much will $\frac{5}{8}$ of a yard cost?

22. Bought $\frac{3}{17}$ of a ton of hay for £3 6s.: how much will $\frac{7}{17}$ of a ton cost?

23. Bought $\frac{4}{9}$ of a hogshead of molasses for £38: how much will $\frac{7}{9}$ of a hogshead cost?

24. If $\frac{3}{4}$ of an acre of land cost £108, how much will $\frac{5}{6}$ of an acre cost?

25. If $\frac{3}{4}$ of a barrel of flour cost £2 10s., how much will $\frac{5}{7}$ of a barrel cost?

26. Paid £4,200 for $\frac{5}{8}$ of a vessel: how much can I afford to sell $\frac{1}{12}$ of the vessel for?

27. Sold 18½ baskets of peaches for 34 crowns: how much would 65½ baskets come to?

28. If I pay £12 10s. for building 20½ rods of wall, how much must I pay for 215½ rods?

29. A man can hoe a field of corn in 6 days, and a boy can hoe it in 9 days: how long will it take them both together to hoe it?

Analysis.—Since the man can hoe the field in 6 days, in 1 day he can hoe $\frac{1}{6}$ of it; and since the boy can hoe it in 9 days, in 1 day he can hoe $\frac{1}{9}$ of it; consequently, in 1 day they can both hoe $\frac{1}{6}+\frac{1}{9}=\frac{5}{18}$ of the field. Now, if $\frac{5}{18}$ of the field requires them both 1 day, $\frac{1}{18}$ of it will require them $\frac{1}{5}$ of a day, and $\frac{18}{18}$ will require them 18 times as long, or $\frac{18}{5}$ of a day, which is equal to 3⅗ days. *Ans.*

30. If A can chop a quantity of wood in 4 hours, and B in 6 hours, how long will it take them both to chop the same quantity?

31. A can dig a trench in 6 days, B in 9 days, and C in 12 days: how long will it take all of them together to dig it?

32. A man bought 25 pounds of tea at 6s. a pound, and paid for it in corn at 4s. a bushel: how many bushels did it take?

Analysis.—If 1 lb. of tea costs 6s., 25 lbs. will cost 25 times as much, which is 150s. Again, if 4s. will buy 1 bushel of corn, 150s. will buy as many bushels as 4s. is contained times in 150s.; and 150s.÷4=37½. *Ans.* 37½ bushels.

The last and similar examples are frequently arranged under the rule of *Barter*.

Barter signifies an exchange of articles of commerce at prices agreed upon by the parties.

Such examples are so easily solved by *Analysis* that a *specific rule* for them is *unnecessary*.

33. A cheesemonger bought 110 lbs. of sugar at 4d. a pound, and paid for it in lard at 8d. a pound: how much lard did it take?

34. How much butter, at 12½d. a pound, must be given for 250 lbs. of tea, at 3s. a pound?

35. How many pounds of tea, at 2s. 6d. per pound, must be given for 56 yds. of cloth, at 4s. 3d. per yard?

36. How many pairs of boots, at 15s. a pair, must be given for 50 tons of coal at £1 10s. per ton?

37. A, B, and C, united in business; A put in £250; B-

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£270; and C, £340; they gained £258: what was each man's share of the gain?

Analysis.—The whole sum invested is £250+£270+£340=£860. Now, since £860 gain £258, it is plain £1 will gain $\frac{258}{860}$ of £258, which is £·30. And

If £1 gains £·30 £250 will gain £250×·30=£75, A's share,
" £1 " " £270 " £270×·30= 81, B's share,
" £1 " " £340 " £340×·30=102, C's share.

Or we may reason thus: Since the sum invested is £860,

A's part of the investment is equal to $\frac{250}{860}$, or $\frac{25}{86}$;
B's " " " $\frac{270}{860}$, or $\frac{27}{86}$;
C's " " " $\frac{340}{860}$, or $\frac{34}{86}$. Conseqnently,
A must receive $\frac{25}{86}$ of the whole gain £258=£75;
B " $\frac{27}{86}$ " " 258= 81;
C " $\frac{34}{86}$ " " 258=102;

Proof.—The whole gain is £258.

When two or more individuals associate themselves together for the purpose of carryiog on a joint business, the union is called a *partnership* or *copartnership*.

The process by which examples like the last one are solved, is often called *Fellowship*.

38. A and B join in a speculation: A advances £1,500 and B £2,500; they gain £1,200: what was each one's share of the gain?

39. A, B, and C, entered into partnership: A furnished £3,000, B £4,000, and C £5,000; they lost £1,800: what was each one's share of the loss?

40. A's stock is £4,200; B's £3,600; and C's £5,400; the whole gain is £2,400: what is the gain of each?

41. A's stock is £7,560; B's £8,240; C's £9,300; and D's £6,200; the whole gain is £625: what is the share of each?

42. A bankrupt owes one of his creditors £400; another £300; and a third £600; his property amounts to £1,000: how much can he pay in the pound; and how much will each of his creditors receive?

The solution of this example is the same in principle as that of Ex. 37.

Examples like the preceding are commonly arranged under the rule of *Bankruptcy*.

A *bankrupt* is a person who is insolvent, or unable to pay his just debts.

43. A bankrupt owes £5,000, and his property is worth £3,500: how much can he pay in the pound?

44. A man died owing £1,640, and his effects were sold for £410: how much per cent. did his estate pay?

45. If a man owes A £624, B £876, and C £000, and has but £1,150, how much will each creditor receive?

46. If I owe £4,800, and have property to the amount of £3,200, how much per cent. can I pay?

47. How much per cent. can a man pay, whose liabilities are £12,000, and whose assets are £4,500?

48. How much per cent. can a man pay, whose liabilities are £150,000, and whose assets are £15,000?

It often happens in storms and other casualties at sea, that masters of vessels are obliged to throw portions of their cargo overboard, or sacrifice the ship and their crew. In such cases, the law requires that the loss shall be divided among the owners of the vessel and cargo, in proportion to the amount of each one's property at stake.

The process of finding each man's loss, in such instances, is called *General Average*.

The operation is the same as that in solving questions in bankruptcy and partnership.

49. A, B, and C, freight a ship from Liverpool to New York; A had on board 100 tons of iron, B 200 tons, and C 300 tons; in a storm 240 tons were thrown overboard: what was the loss of each?

50. A packet worth £36,000 was loaded with a cargo valued at £65,000. In a tempest the master threw overboard £25,250 worth of goods: how much per cent. was the general average?

51. A steam ship being in distress, the master threw $\frac{1}{4}$ of the cargo overboard; finding she still laboured, he afterwards threw overboard $\frac{1}{3}$ of what remained. The steamer was worth £12,000, and the cargo £24,000: how much per cent. was the general average, and what would be a man's loss who owned $\frac{1}{4}$ of the ship and cargo?

52. A man mixed 25 bushels of peas, worth 6s. a bushel, with 15 bushels of corn worth 4s. a bushel, and 20 bushels of oats worth 3s. a bushel: what was the mixture worth per bushel?

Analysis.—25 bu. peas at 6s.=150s., value of the peas;
15 bu. corn at 4s.= 60s., " " corn;
and 20 bu. oats at 3s.= 60s., " " oats.

The mixture=60 bu. and 270s., value of whole mixtr.

Now, if 60 bu. mixture are worth 270s., 1 bu. mixture is worth $\frac{1}{60}$ of 270s., and 270s.÷60=4$\frac{1}{2}$s. *Ans.*

Proof.—60 bu. at 4$\frac{1}{2}$s.=270s., the value of the whole mixture.

The process of finding the value of a compound or mixture of articles of different values, or of forming a compound which shall have a given value, is called *Alligation*. Alligation is usually divided into two kinds, *Medial* and *Alternate*.

When the prices of the several articles and the number or quantity of each are given, the process of finding the *value* of the mixture, as in the last example, is called *Alligation Medial*.

When the *price* of the mixture is given, together with the price of each article, the process of finding how much of the several articles must be taken to form the required mixture, is called *Alligation Alternate*. Alligation Alternate embraces *three* varieties of examples, which will be pointed out in the following notes.

53. If you mix 40 gallons of sperm oil worth 8s. per gallon, with 60 gallons of whale oil worth 3s. per gallon, what will the mixture be worth per gallon?

54. At what price per pound can a grocer afford to sell a mixture of 30 lbs. of tea worth 4s. a pound, and 40 lbs. worth 7s. a pound?

55. If 120 lbs. of butter at 10d. a pound are mixed with 24 lbs. at 8d. and 24 lbs. at 5d. a pound, what is the mixture worth?

56. A tobacconist has three kinds of tobacco, worth 3s. 9d., 4s. 6d., and 6s. 3d. a pound: what is the mixture of 100 lbs. of each worth per pound?

57. A liquor dealer mixed 200 gallons of gin worth £1 a gallon, with 100 gallons of brandy worth £1 5s. a gallon: what was the value of the mixture per gallon?

58. A grocer sells the finest souchong tea at 10s. a pound, and hyson at 4s.: what part of each must be taken to form a mixture which he can afford to sell at 6s. a pound?

Note.—1. It will be observed in this example that the price of the *mixture* and also the price of the several *articles* or *ingredients* are given, to find *what part* of each the mixture must contain.

Analysis.—Since the souchong is worth 10s. and the required mixture 6s., it is plain he would lose 4s. on every pound of souchong which he puts in. And since the hyson is worth 4s. a pound and the mixture 6s., he would gain 2s. on every pound of hyson he puts in. The question, then, is this: How much hyson must he put in to make up for the loss on 1 lb. of souchong? If 2s. profit require 1 lb. of hyson, 4s. profit will require twice as much, or 2 lbs. He must, therefore, put in 2 lbs. of hyson to 1 lb. of souchong.

Proof.—2 lbs. of hyson, at 4s. a pound, are worth 8s., and 1 lb. of souchong is worth 10s. Now 8s.+10s.=18s. And if 3 lbs. mixture are worth 18s., 1 lb. is worth $\frac{1}{3}$ of 18s., which is 6s., the price of the mixture required.

59. A farmer has oats which are worth 20s. a quarter, rye 55s., and barley 60s., of which he wishes to make a mixture worth 50s. per quarter: what part of each must the mixture contain?

Analysis.—The prices of the rye and barley must each be compared with the price of the oats. If 1 quarter of oats gains 30s. in the mixture, it will take as many quarters of rye to balance it, as 5s. (the loss per quarter) are contained times in 30s., viz. 6 quarters. Again, since 1 quarter of oats gains 30s., it will take as many quarters of barley to balance it, as 10s. (the loss per quarter) are contained times in 30s., viz. 3 quarters. Hence, the mixture must contain 2 parts of oats, 6 parts rye, and 3 parts barley.

60. If a man have four kinds of currants worth 8 0 11 and

12 pence a pound respectively, how much of each kind must he take to form a mixture worth 10d. a pound?

Note.—2. In examples like the preceding, we compare two kinds together, one of a higher and the other of a lower price than the required mixture; then compare the other two kinds in the same manner. In selecting the pairs to be compared together, it is necessary that the price of one article shall be above, and the other below the price of the mixture. Hence, when there are several articles to be mixed, some cheaper and others dearer than the mixture, a variety of answers may be obtained. Thus, if we compare the highest and lowest, then the other two, the mixture will contain 1 part at 8d.; 1 part at 9d.; 1 part at 11d.; and 1 part at 12d. Again, by comparing those at 8d. and 11d., and those at 9d. and 12d. together, we obtain for the mixture 1 part at 8d.; 2 parts at 11d.; 2 parts at 9d.; and 1 part at 12d.

Other answers may be found by comparing the first with the third and fourth; and the second with the fourth, etc.

61. A goldsmith having gold 16, 18, 23, and 24 carats fine, wished to make a mixture 21 carats fine: what part of each must the mixture contain?

62. A farmer had 30 bu. of corn worth 6s. a bu., which he wished to mix with oats worth 3s. a bu., so that the mixture might be worth 4s. per bu.: how many bushels of oats must he use?

Note.—3. In this example, it will be perceived that the price of the mixture, with the prices of the several articles and the *quantity* of one of them are given, to find *how much* of the other article the mixture *must contain*.

Analysis.—Reasoning as above, we find that the mixture (without regard to the specified quantity of corn) in order to be worth 4s. per bu, must contain 2 bu. of oats to 1 bu. of corn. Hence, if 1 bu. of corn requires 2 bu. of oats to make a mixture of the required value, 30 bu. of corn will require 30 times as much; and 2 bu. × 30=60 bu, the quantity of oats required.

63. A merchant wished to mix 100 gallons of oil worth 6s. 8d. per gallon, with two other kinds worth 2s. 6d. and 3s. 4d. per gallon, so that the mixture may be worth 5s. per gallon: how many gallons of each must it contain?

64. A merchant has Havanna coffee at 1s. and Java at 1s. 6d. per pound, of which he wishes to make a mixture of 150 lbs., which he can sell at 1s. 4d. a pound; how much of each must he use?

LESSONS IN GREEK.—No. LVIII.

By John R. Beard, D.D.

The Predicate with a Double Accusative.

There may be a double accusative with a transitive verb when the action of the verb operates equally on a person and on a thing. Such verbs, in Greek, are the following:—

1. Verbs which have as their object the abstract idea conveyed in the verb, take also in the accusative the person affected by the verbal action. This construction is most frequent in cases where the abstract object is indicated by an adjective or pronoun in the neuter gender: *e.g.*

Σωκρατης εκαστον επειρατο ευεργετειν την μεγιστην ευεργεσιαν
Socrates endeavoured to confer on each the greatest benefit.

You must sometimes depart considerably from the verbal form of the Greek in order to render constructions of this kind into good English. The remark is exemplified in the translation just given. Sometimes the neuter pronoun will have to be made dependent on a preposition: *e.g.*

τοιαυτα εγκωμαζουσι την αρετην
in such things they praise virtue.

With verbs denoting to divide, μερη (parts), and similar words, are to be regarded as representing the abstract accusative; and, accordingly, the persons among whom the division is made are added in the accusative case. Of these accusatives, the one is called "the accusative of the person," and the other, "the accusative of the thing:" *e.g.*

Accusative of the thing.	*Accusative of the person.*
τρεις μοιρας three parts	εδασατο παντα τον πεζον στρατον he divided among the infantry.

2. Verbs which signify to do good or ill to a person, to say good or ill of a person, take the person in the accusative, and, when the thing is indicated by a noun, have, in consequence, a double accusative. Accordingly we say in Greek—

αγαθα κακα	ποιειν, or δρᾶν, or ιραζεσθαι τινα
αγαθα κακα	λελειν, or αγορευειν τινα

Βασιλεως αγαθου εργον εστι τους αρχομενους αγαθα ποιειν
it is the office of a good king to do good to his subjects.

τα ισχατα ελεγον αλληλους
they said the worst things of each other.

Instead of the definite terms *αγαθα*, *κακα*, etc., you may have a demonstrative, relative, or interrogative pronoun: *e.g.*

τί μ' ιργασω;
what hast thou done to me?

Sometimes the person appears in the dative, when the person does not immediately receive the action of the verb: *e.g.*

αγαθον επραξε τη πολει
he did a good thing for the state.

Thus arises a difference between these two phrases:

τί σε ποιησουσιν οἱ μαρτυρες;
in what will the witnesses help you?

τι σοι ποιησουσιν οἱ μαρτυρες;
what will the witnesses do for you?

3. The following verbs also take an accusative of the person and an accusative of the thing; namely, διδασκειν, to learn; παιδευειν, to educate; αναμιμνησκειν, ὑπομιμνησκειν, to remind; κρυπτειν, κρυπτεσθαι, αποκρυπτεσθαι, αιθειν, to conceal; ερωτᾶν, ερεσθαι, to ask, inquire; εξιταζειν, to investigate; αιτεῖν, αιτεῖσθαι, αξιοῦν, to request, to claim; πραττειν, πραττεσθαι, to carry on, to manage, to take from, as a fee or tribute: *e.g.*

Σωκρατης σωφροσυνην εδιδαξε τους συνοντας
Socrates taught his scholars soundmindedness.

Οἱ στρατηγοι τους πολιτας εκατον ταλαντα επραξαν
the generals made the citizens pay a hundred talents.

Several of these verbs admit of another construction. Thus αναμιμνησκειν and ὑπομιμνησκειν commonly take the thing in the genitive. Instead of ερωτᾶν τινα τι, to ask some one something, we find ερωτᾶν τινα περι τινος, to ask some one respecting something; and instead of αιτεῖν or αιτεῖσθαι τινα τι, we find αιτεῖν τι παρα τινος.

4. Verbs which signify to put on, to clothe, as ενδυειν, αμφιεννυναι; to put off or take off, εκδυειν; to take away, deprive, αφαιρεῖσθαι, στερισκειν, αποστερεῖν; to plunder, συλᾶν, put both the person and the thing in the accusative: *e.g.*

Τα ἡμεταρα ἡμας αποστερεῖ Φιλιππος
Philip deprives us of our own.

Together with αποστερεῖν τινα τι, we find also very often αποστερεῖν τινα τινος, and sometimes αποστερεῖν τινος τι, αφαιρεισθαι τινος τι.

A double accusative is found also with those verbs the idea of which in the predicate is too wide to be fully expressed without the addition of an explanatory attribute; this attribute stands in agreement with the object, and is accordingly for the most part put into the accusative. Such verbs, are to name or appoint, to bring up for, to declare as, to show yourself so and so, etc.: *e.g.*

Σοφιστην ονομαζουσι τον ανδρα τουτον
they call this man a sophist.

The Accusative of the End and of Dimension.

The end toward which an action is directed is generally put in the accusative in union with a preposition, εις, προς, επι. The poets, however, especially of the epic class, with the verbs, to come, reach, go, sometimes employ the accusative alone to denote the end or object which a person strives for, when attained: *e.g.*

την νησον αφικετο
he reached the island.

Dimensions of place, by which intervals are measured, and

the time during which a condition lasts, are indicated by the accusative without a preposition:

Place. απεχει ἡ Πλαταια των Θηβων σταδιους ἑβδομηκοντα
Platea is seventy stadia distant from Thebes.

Time. μενατε ταυτην την ἡμεραν
remain this day.

Exercises.—Greek-English.

Ὁ Φωκικος πολεμος ἀειμνηστον παιδειαν νους Θηβαιους ἐπαιδευσεν. Σωκρατης, ἠδη Μελητου γεγραμμενου αυτου την γραφην, περι παντων μαλλον ἡ περι της δικης διελεγετο. Θρασυβουλος ὡρκωσε παντας τους στρατιωτας τους μεγιστους ὁρκους, ου χρη μιμησεις πονηρας μιμεῖσθαι τους πολεμιους. Ονομα ποιον αυτον ονομαζει πατηρ; καλοῦσι με τοῦτο το ονομα. Ὁ Σωκρατης δικαιος ὁυτως ἠν, ὡστε βλαπτειν μηδε μικρον μηδενα, ωφελεῖν δε τα μεγιστα τους χρωμενους ἑαυτῷ. Πολλα αν τις ἐχοι Σωκρατην ἐπαινεσαι. Ουδε ταδε αιτιῶμαι τον Θεον. Των συμμοριῶν ἑκαστην διελεῖν κελευω πεντε μερη. Ἡ γη τους ἀριστα θεραπευοντας αυτην πλεῖστα αγαθα αντιποιεῖ. Οἱ πονηροι αει τι κακον ἐργαζονται τους ἐγγυτατω ἑαυτων οντας. Πολλα κακα εἶπεν ανθρωπους. Πᾶς τις το γυναικεῖον φῦλον κακα πολλ' ἀγορευει. Ταυτα μοι ποιοῦσιν. Ταυτα μοι ποιοῦσιν. Ου φροντιστεον ὁ τι ἐροῦσιν οἱ πολλοι ἡμᾶς. Ὁ χρονος και ἡ ἐμπειρια τα μη καλῶς ἐχοντα ἐκδιδασκει τους ανθρωπους. Ποιοῦσιν οἱ τεχνῖται ἁ οἱ διδασκαλοι αυτους ἐπαιδευσαν. Τρια ωνα τους παῖδας παιδευουσιν οἱ Περσαι, ἱππευειν και τοξευειν και αληθιζισθαι. Ἀναμνησω ὑμας τους τῶν προγονων τῶν ἡμετερων κινδυνους. Ου σε κρυψω την ἐμην γνωμην. Ἐρωτῶ σε τας των φιλων τυχας. Νῦν δε ἐμε πολλοι οικεται σῖτον αιτοῦσι, πολλοι δε ἱματια. Τἀγαθα αιτοῦμεν τους θεους. Σωκρατης ουδενα των συνοντων ἐπραξατο τῆς συνουσιας μισθον. Γλῶτταν τε την Αττικην και τροπους τῶν Αθηναιων ἐδιδασκον τους παῖδας. Κῦρος το στρατευμα κατενειμε ὠδικα μερη. Τον μονον μοι και φιλον παῖδα ἀφειλετο την ψυχην. Την τιμην αποστερεῖ με; κρυπτω σε το ατυχημα. Παῖς μεγας, μικρον ἐχων χιτῶνα, ἑτερον παῖδα μικρον, μεγα ἐχοντα χιτῶνα, ἐκδυσας αυτον, τον μεν ἑαυτοῦ ἐκεῖνον ἡμφιεσε, τον δε ἐκεινου αυτος ἐνεδυ. Ὁ Κυρος τον Γωβρυαν απεδειξε στρατηγον. Πλουτον και τιμην και δοξαν αγαθα νομιζουσιν οἱ πολλοι. Τον θανατον ου κακον ἡγεῖσθαι χρη, αλλα κακῶν απαλλαγην. Θεμιστοκλης Κλεοφαντον τον υἱον ἱππια ἐδιδαξατο αγαθον. Το ψεῦδος ου δυνασαι αληθες ποιεῖν. Ἡ Ἐφεσος απεχει απο Σαρδεων τριῶν ἡμερων ὁδον. Ὁ Ἀρχιλαος κατασχων τρεῖς ἡ τεττερας ἡμερας την τυραννιδα ἐτελευτησεν. Ευδαιμονεσταται πολεις λεγονται αἱ αν πλειστον χρονον ἐν ἐιρηνῃ διατελῶσιν. Αἱ σπονδαι ἐνιαυτον ἐσονται.

Vocabulary, etc.

Ἀειμνηστος (α and μιμνησκομαι), not to be forgotten; "gave the Thebans a lesson not to be forgotten."

Μελητος, ου, the person who preferred against Socrates the charge that ended in his death; "Melitus having accused him;" περι της δικης, "concerning the trial."

Χραομαι, I use, have intercourse with; τους χρωμ, "those who were intimate with him."

Συμμορια, ας, ἡ, participation; historically a division or class of sixty opulent Athenians, who, in common, had to provide resources for war; there were in all twenty συμμοριαι, or classes.

Το γυν. φῦλον, "the female tribe;" spoken contemptuously.

Αληθιζομαι (αληθης), to observe the truth.

Σωκ. ἐπρα. της συνουσιας, Socrates took no fee, "no reward for his company;" that is, no remuneration for his instructions.

Ἱππευς, εως, a horseman "taught him to be a good horseman."

Why is ἀειμνηστος in the form of ἀειμνηστον, while its noun, παιδεια, is of the feminine gender?

What parts of the verbs are these—ἐπαιδευσα; γεγραμμενον; διελεγετο; ὡρκωσε; μιμεῖσθαι; ἐπαινεσαι; αἰτιῶμαι; διελεῖν; εἶπε; ἀναμνησω; κρυψω; κατενειμε; ἀφειλετο; You are to give the root in each case, and conjugate the part.

Explain the augment in these verbs—ἀφειλετο; ἐδιδαξατο; ἐτελευτησεν; ὡρκωσε; εἰπεμφιεσε.

Explain in full the constructions, Μελητου γεγραμμενου αυτου την γραφην; ου σε κρυψω την ἐμην γνωμην.

Mark exactly how the English differs from the Greek in καλοῦσι με τοῦτο το ονομα.

To which class of verbs does καλοῦσι belong? Write out the verb in full; including the middle voice and the passive as well as the active.

Explain the construction (what case they represent, and why) of the verbs ἱππευειν, τοξευειν, αληθιζισθαι.

Decline these nouns—Σωκρατην; φῦλον; πατηρ; τεχνῖται; γνωμην; Ἀθηναιων; γλῶτταν; χιτῶνα; τελος; σφαιρᾳ.

English-Greek.

The father taught his son a lesson he would not forget. Of what (τί) did Miletus accuse Socrates? Miletus accused Socrates of impiety (ασεβεια). They discourse respecting the trial. Pericles makes the Athenians swear an oath. Boys imitate the bad deeds of boys. (By) what name do they call your father? They call me Alexander. They call my sister Helen. I assist my associates in the best things. They ask all good from God. I divide the kingdom into five parts. Good men do good to good men; bad men to bad. The wicked speak ill of the good. That bad boy spoke ill of his father. Good children will always speak well of their parents. He takes no fee from his pupils. He took the coat from the man and put it on himself. He will deprive his family of much good. I teach my children one thing, virtue. They reminded the soldiers of their valour of old. Ask truly good things from God. I have asked God for wisdom and virtue. Thou teachest young men the Attic language. They hide their misfortune from all men. The queen appointed Wellington general. I consider knowledge and self-control riches and honour. He tries to make the lie true. The city continued at war six months.

Poetic Idiom.

These lessons are chiefly designed as an introduction to the reading of Greek prose. For the most part, in consequence, the remarks, the paradigms, the rules, and the examples, have been confined to Greek prose, and especially to the Attic writers. Yet, as something like completeness is aimed at, now and then an observation has been made as to poetic usage. In older manuals, the diction of prose and the diction of poetry were confusedly blended together. In the rich treasury of examples of Greek usage found in Matthiæ's excellent Greek Grammar, very many are from the poets. But in all languages poets take great license; and a construction, or a word, which is very good in poetry, may be inadmissible in prose. Hence, the necessity of distinguishing between the two in grammatical treatises, and of limiting the matter to prose usage in a manual intended to instruct students in the art of reading prose. Nevertheless, as poetic usage is—as poetic usage—good Greek, so a student should not, even at an early period of his studies, be left entirely ignorant of it, especially as it is only by some acquaintance with it that he can appreciate the difference of poetic usage from prose usage. And the rather is some knowledge of poetic idiom desirable, because the words of the language are often presented by it in their simpler forms, so as to lead the pupil to an acquaintance with the primitives of the Greek; which, as I have already intimated, are not very numerous. In order, therefore, to assist you, my fellow-learners, to form some faint conception (more, here, I cannot hope for) with the idiom of Greek poetry, I shall lay before you a number of Γνωμαι, that is, apothegms, proverbs, or pithy sayings, taken from ancient Greek writers.

Γνωμαι.

1. Ἀρχην ἁπαντων και τελος ποιει Θεος.
2. Ἑτοιμος αει ευσεβῶν μοιρα ὁ Χριστος.
3. Ἁγιοι ἐν χορῳ ἀγων ἀγαλλονται.
4. Σφαιρᾳ ὁ κοσμος εικει.
5. Χωρις αγκυλης τοξον και πτυου ἐλπιδος ἡτορ, ὁμοιως πρεπουσι.

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6. Οπα Λιος ουκ αλεγουσι φρενας.
7. Θεου διδοντος, ουδεν ισχυει φθονος.
8. Θεου μη διδοντος, ουδεν ισχυει πονος.
9. Ρημα θειον κανων βιου.
10. Ὸν φιλεῖ Θεος θνησκει νεος.

VOCABULARY.

2. Μοσυνη, ης, ἡ (from μενω), *a dwelling-place, a tower.*
3. Χορος, ου, ὁ (our *choir*), *an assembly; αγαλλω, I make to shine,* mid. *I rejoice.*
4. Εικω (an archaism), *I resemble;* compare εικων, *an image.*
5. Αγκελη, ης, ἡ, *an arrow;* ἡτωρ, ορος, το, *heart, spirit.*
6. Αλεγω (an Homeric word), *I care for, I attend to;* φενακἄκος, ὁ, *a flatterer.*
9. Κανων, ονος, ὁ, *a reed* or *staff;* hence, *a measure* or *rule.*
10. Arrange thus, Θνησκει νεος ὸν Θεος φιλεῖ.

Let it be observed that I do not give the meaning of those words which I think the scholar ought to be acquainted with; nor do I explain constructions in which he ought to find no difficulty. Too much assistance is almost as bad as too little. If the student has made out the lists of words I requested, he will easily be able to refresh his memory from his own resources.

Observe the disuse of the article in these poetic forms: *e.g.* αρχην, for την αρχην; ἁπαντων, for τῶν ἁπαντων; τελος, for το τελος; and Θεος, for ὁ Θεος. Other instances are found above, and will appear in future exercises.

LESSONS IN ITALIAN GRAMMAR.—No. XLIV.

Scrivere, to write.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *scrivere*, to write	Past: *avére scritto*, to have written
Present Gerund: *scrivéndo*, writing	Past Gerund: *avéndo scritto*, having written
Past Participle: *scritto*, written	

INDICATIVE MOOD.

Present.

Scrivo, I write
scrivi, thou writest
scrive, he writes
scriviámo, we write
scrivéte, you write
scrivono, they write

Imperfect.

Scrivéva or *scrivéa*, I was writing
scrivévi, thou wast writing
scrivéva or *scrivéa*, he was writing
scrivevámo, we were writing
scrivevéte, you were writing
scrivévano, they were writing

Indeterminate Preterite.

Scrissi, I wrote
scrivésti, thou wrotest
scrisse, he wrote
scrivémmo, we wrote
scrivéste, you wrote
scrissero, they wrote

Future.

Scriverò, I shall or will write
scriverái, thou wilt write
scriverà, he will write
scriveréno, we will write
scriveréte, you will write
scriveranno, they will write

Conditional Present.

Scriveréi, I should or would write
scriverésti, thou wouldst write
scriverébbe, he would write
scriverémmo, we would write
scriveréste, you would write
scriverébbero, they would write

IMPERATIVE MOOD.

[No First Person.]
Scrivi, write (thou)
scriva, let him write
scriviámo, let us write
scrivéte, write (ye or you)
scrivano, let them write

SUBJUNCTIVE MOOD.

Present.

Che scriva, that I may write
che scriva, that thou mayst write
che scriva, that he may write
che scriviámo, that we may write
che scriviáte, that you may write
che scrivano, that they may write

Imperfect.

Che scrivéssi, that I might write
che scrivéssi, that thou mightst write
che scrivésse, that he might write
che scrivéssimo, that we might write
che scrivéste, that you might write
che scrivéssero, that they might write

So conjugate—

Circonscrivere, to circumscribe
Contrascrivere, to write against
Descrivere, to describe
Inscrivere, to inscribe
Prescrivere, to prescribe
Proscrivere, to proscribe
Riscrivere, to write again
Soscrivere, *Sottoscrivere*, to subscribe
Soprascrivere, to put the direction
Trascrivere, to transcribe

Sólvere, to untie.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *sólvere*, to untie	Past: *avére soluto*, to have untied
Present Gerund: *solvéndo*, untying	Past Gerund: *avéndo soluto*, having untied
Past Participle: *soluto*, untied	

INDICATIVE MOOD.

Present.

Sólvo, I untie
sólvi, thou untiest
sólve, he unties
solviámo, we untie
sovéte, you untie
sólvono, they untie

Imperfect.

Solvéva or *solvéa*, I was untying
solevévi, thou wast untying
soleéva or *solvéa*, he was untying
solevámo, we were untying
solvevéte, you were untying
solvévano or *solvéano*, they were untying

Indeterminate Preterite.

Solvéi or *sólsi*, I untied
solvésti, thou untiedst
solvè or *sólse*, he untied
solvémmo, we untied
solvéste, you untied
solvérono or *sólsero*, they untied

Future.

Solverò, I shall or will untie
solverái, thou wilt untie
solverà, he will untie
solveréno, we will untie
solveréte, you will untie
solverànno, they will untie

Conditional Present.

Solveréi, I should or would untie
Solverésti, thou wouldst untie
solverébbe, he would untie
solveréммo, we would untie
solveréste, you would untie
solverébbero, they would untie

IMPERATIVE MOOD.

[No First Person.]
Sólvi, untie (thou)
sólva, let him untie
solviámo, let us untie
solvéte, untie (ye or you)
sólvano, let them untie

SUBJUNCTIVE MOOD.

Present.

Che sólva, that I may untie
che sólva, that thou mayst untie
che sólva, that he may untie
che solviámo, that we may untie
che solviáte, that you may untie
che sólvano, that they may untie

Imperfect.

Che solvéssi, that I might untie
che solvéssi, that thou mightst untie
che solvésse, that he might untie
che solvéssimo, that we might untie
che solvéste, that you might untie
che solvéssero, that they might untie

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So conjugate—

Infinitive.	Present.	Indet. Pret.	Past Part.	English.
Asciólvere,	*asciólvo,*	*asciólsi,*	*asciólto,*	to take lnneh
Assólvere,	*assólvo,*	*assólsi,*	*assólto* or *úto,*	absolve
Dissólvere,	*dissólvo,*	*dissólsi,*	*dissólto* or *úto,*	dissolve
Risólvere,	*risólvo,*	*risólsi,*	*risólto or úto,*	resolve

Vivere, to live.

Infinitive Mood

Simple Tenses.	*Compound Tenses.*
Present: *vivere,* to live	Past: *avére vivúto,* to have lived
Present Gerund: *vivéndo,* living	Past Gerund: *avéndo vivúto,* having lived
Past Participle: *vivúto* or *visúto,* lived	

Indicative Mood.

Present.	
Vivo, I live	*vivéste,* you lived
vivi, thou livest	*vissero,* they lived
vive, he lives	
viviámo, we live	Future.
vivéte, you live	*Vivcrò* or *vivrò,* I shall or will live
vivono, they live	*vivcrài,* thou wilt live
Imperfect.	*vivcrà,* he will live
Vivéva or *vivéa,* I was living	*vivcrémmo,* we will live
vivévi, thou wast living	*vivcréte,* you will live
vivéva or *vivéa,* he was living	*vivcránno,* they will live
vivevámo, we were living	Conditional Present.
vivevàte, you were living	*Vivcrci, vivcrèi,* or *viverìa,* I should or would live.
vivévano or *vivéano,* they were living	*vivcrésti,* thou wouldst live
Indeterminate Preterite.	*vivcrébbe* or *viverìa,* he would live
Vissi, I lived	*vivcrémmo,* we would live
vivésti, thou livedst	*vivcréte,* you would live
visse, he lived	*vivcrébbero,* they would live
vivémmo, we lived	

Imperative Mood.

[No First Person.]	
Vivi, live (thou)	*viviámo,* let us live
viva, let him live	*vivéte,* live (ye or you)
	vívano, let them live

Subjunctive Mood.

Present.	Imperfect.
Che viva, that I may live.	*Che vivéssi,* that I might live
che viva or *vivi,* that thou mayst live	*che vivéssi,* that thou mightst live
che viva, that he may live	*che vivéste,* that he might live
che viviámo, that we may live	*che vivéssimo,* that we might live
che viviáte, that you may live	*che vivéste,* that you might live
che vívano, that they may live	*che vivéssero,* that they might live

So conjugate—

Convivere, to live together	*Survivere,* to survive
Benevivere, to live well	*Sopravivere,* to survive.
Rivivere, to revive	

IRREGULAR VERBS OF THE THIRD CONJUGATION.

Table of the terminations of the Verbs in *isco.*

Infinitive Mood.

Present.	*-ire*	Pres. Ger.	*-indo*	Past Part.	*-ito*

Indicative Mood.

Present	*-isco*	*-isci*	*-isce*	*-idmo*	*-ite*	*-iscono*
Imperfect	*-iva*	*-ivi*	*-iva*	*-ivàmo*	*-ivàte*	*-ivano*
Iodet. Pret.	*-ii*	*-isti*	*-ì*	*-immo*	*-iste*	*-irono*
Future	*-irò*	*-irài*	*-irà*	*-irémo*	*-irète*	*-iranno*
Con. Pres.	*-irèi*	*-irésti*	*-irébbe*	*-irémmo*	*-iréste*	*-irébbero*

Imperative Mood.

[No First Person.]	*-isci*	*-isca*	*-idmo*	*-ite*	*-iscano*

Subjunctive Mood.

Present	*-isca*	*-isca*	*-isca*	*-idmo*	*-iate*	*-iscano*
Imperf.	*-issi*	*-issi*	*-isse*	*-issimo*	*-iste*	*-issero*

LESSONS IN SPANISH.—No. XIV.

Conjugation.—*Continued.*

IRREGULAR VERBS.

The irregular verbs in Spanish are such as do not conform exactly in their manner of conjugation to the model verbs (*amar, comer, vivir*). The deviations of each irregular verb are in most cases but slight, yet important to be known, as most of the irregular verbs are in general use.

There are thirty-nine of the different irregular verbs: seven of the first conjugation, seventeen of the second, and fifteen of the third. Many of these differ but very slightly from each other. All the irregular verbs are conjugated like some one of these thirty-nine forms. Four of these, *haber, ser, estar,* and *tener,* have already been conjugated.

Those verbs which undergo slight changes in the verb-roots or verb-endings of certain tenses or persons of tenses, are not on that account deemed irregular, since these changes take place solely to preserve *regularity* and uniformity of sound, which would be dissimilar in some cases if these changes did not take place. Thus, as before mentioned, *buscar,* pronounced *boos-kar,* would, in the present tense of the subjunctive mood, if no change of letters should occur, be *busce,* pronounced *boós'-thay* (e before *e* and *i* being sounded like *th* in *thin*), and to preserve the hard sound of *c,* this letter is changed into *qu*; thus, *busque,* pronounced *boós'-kay.* Both regular and irregular verbs undergo such changes when required by the rules of pronunciation.

Remark.—In the following conjugations of the irregular verbs, those persons of the moods and tenses only which deviate from the regular conjugation are given. Thus, in the first verb, *andar,* no tense of the indicative mood except the perfect definite is given, because this verb is conjugated regularly in the other tenses of this mood. In the second verb, *contar,* the first and second persons plural of the present indicative are not given, because these persons are regular. The student is therefore to remember that all moods, tenses, and persons not included in the conjugation are regular. We have, however, in all cases given the participle and gerund, whether formed regularly or not.

Conjugations of Irregular Verbs.

1*st Conjugation.*

Andar, to walk.

Past Participle: *andado.* | Gerund: *andando.*

Indicative Mood.

Perfect Definite.

Anduve,	*Anduvimos,*
Anduviste,	*Anduvisteis,*
Anduvo,	*Anduvieron,*

Subjunctive Mood.

Imperfect.

Anduviera, anduviese,	*Anduviéramos, anduviésemos,*
Anduvieras, anduvieses,	*Anduvierais, anduvieseis,*
Anduviera, anduviese,	*Anduvieran, anduviesen*

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First Future.

Anduviere,
Anduvieres,
Anduviere, | *Anduviéremos,* *Anduviéreis,* *Anduvieren,*

Contar, to relate.

Past Participle: *contado.* | Gerund: *contando.*

Indicative Mood.

Present.

Cuento,
Cuentas,
Cuenta, | *Cuentan,*

Imperative Mood.

Cuente,
Cuenta,
Cuente, | *Cuenten,*

Subjunctive Mood.

Present.

Cuente,
Cuentes,
Cuente, | *Cuenten,*

This verb changes *o* of the verb-root into *ue*, in the three persons singular and third person plural of the present indicative, imperative, and present subjunctive.

Dar, to give.

Past Participle: *dado.* | Gerund: *dando.*

Indicative Mood.

Present.

Doy, | [No other Persons Irregular.]

Perfect Definite.

Di,
Diste,
Dió, | *Dimos,* *Disteis,* *Dieron,*

Subjunctive Mood.

Imperfect.

Diera, diese,
Dieras, dieses,
Diera, diese, | *Diéramos, diésemos,* *Dierais, dieseis,* *Dieran, diesen,*

First Future.

Diere,
Dieres,
Diere, | *Diéremos,* *Diereis,* *Dieren,*

Jugar, to play.

Past Participle: *jugado.* | Gerund: *jugando*

Indicative Mood.

Present.

Juego,
Juegas,
Juega, | *Juegan,*

Imperative Mood.

Juegue,
Juega,
Juegue, | *Jueguen,*

Subjunctive Mood.

Present.

Juegue,
Jueguez,
Juegue, | *Jueguen,*

This verb takes *e* before *g* of the verb-root in the three persons singular and third person plural of the present indicative, the imperative, and present subjunctive.

Tentar, to try, to tempt.

Past Participle: *tentado.* | Gerund: *tantando.*

Indicative Mood.

Present.

Tiento,
Tientas,
Tienta, | *Tientan,*

Imperative Mood.

Tiente,
Tienta,
Tiente, | *Tienten,*

Subjunctive Mood.

Present.

Tiente,
Tientes,
Tiente, | *Tienten,*

This verb takes *i* before *e* of the verb-root in the same persons and tenses as are irregular in the preceding verb.

Errar, to err.

Past Participle: *errado.* | Gerund: *errando.*

Indicative Mood.

Present.

Yerro,
Yerras,
Yerra, | *Yerran,*

Imperative Mood.

Yerre,
Yerra,
Yerre, | *Yerren*

Subjunctive Mood.

Present.

Yerre,
Yerres,
Yerre, | *Yerren,*

This verb is irregular in the same persons and tenses as *tentar*, and takes *y* before *e* of the verb-root in all the irregular persons.

2nd Conjugation.

Caber, to be contained, to have room.

Past Participle: *cabido.* | Gerund: *cabiendo.*

Indicative Mood.

Present.

Quepo, | [No other Persons Irregular.]

Perfect Definite.

Cupe,
Cupiste,
Cupo, | *Cupimos,* *Cupisteis,* *Cupieron,*

First Future.

Cabré,
Cabrás,
Cabrá, | *Cabremos,* *Cabréis,* *Cabrán.*

Imperative Mood.

Quepa,
Quepa, | *Quepamos,* *Quepan,*

Subjunctive Mood.

Present.

Quepa,
Quepas,
Quepa, | *Quepamos,* *Quepais,* *Quepan.*

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Imperfect.

Cupiera, cabria, cupiese,	*Cupiéramos, cabríamos, cupiésemos,*
Cupieras, cabrías, cupieses,	*Cupierais, cabríais, cupieseis,*
Cupiera, cabría, cupiese,	*Cupieran, cabrían, cupiesen,*

First Future.

Cupiere,	*Cupiéremos,*
Cupieres,	*Cupiereis,*
Cupiere,	*Cupieren,*

Caer, to fall.

Past Participle: *caido.* | Gerund: *cayendo.*

Indicative Mood.

Present.

Caigo,	[No other Persons Irregular.]

Imperative Mood.

Caiga,	*Caigamos,*
Caiga,	*Caigan,*

Subjunctive Mood.

Present.

Caiga,	*Caigamos,*
Caigas,	*Caigais,*
Caiga,	*Caigan,*

This verb take *ig* after the verb-root, in the first person singular of the present indicative, in the first and third persons singular and plural of the imperative, and in all the persons of the present subjunctive.

Hacer, to make, to do.

Past Participle: *hecho.* | Gerund: *haciendo.*

Indicative Mood.

Present.

Hago,	[No other Persons Irregular.]

Perfect Definite.

Hice,	*Hicimos,*
Hiciste,	*Hicisteis,*
Hizo,	*Hicieron,*

First Future.

Haré,	*Haremos,*
Harás,	*Haréis,*
Hará,	*Harán,*

Imperative Mood.

Haga,	*Hagamos,*
Haz,	
Haga,	*Hagan,*

Subjunctive Mood.

Present.

Haga,	*Hagamos,*
Hagas,	*Hagáis,*
Haga,	*Hagan,*

Imperfect.

Hiciera, haría, hiciese,	*Hiciéramos, haríamos, hiciésemos,*
Hicieras, harías, hicieses,	*Hicierais, haríais, hicieseis,*
Hiciera, haría, hiciese,	*Hicieran, harían, hiciesen,*

First Future.

Hiciere,	*Hiciéremos,*
Hicieres,	*Hiciereis,*
Hiciere,	*Hicieren,*

Satisfacer, one of the compounds of the verb *hacer*, has in the second person singular of the imperative mood both *satisfaz* and *satisface.*

Mover, to move.

Past Participle: *movido.* | Gerund: *moviendo.*

Indicative Mood.

Present.

Muevo,	
Mueves,	
Mueve,	*Mueven*

Imperative Mood.

Mueva,	
Muevo,	
Mueva,	*Muevan,*

Subjunctive Mood.

Present.

Mueva,	
Muevas,	
Mueva,	*Muevan,*

This verb changes o of the verb-root into *ue* in the three persons singular and third person plural of the present indicative, the imperative, and present subjunctive.

Oler, to smell.

Past Participle: *olido.* | Gerund: *oliendo.*

Indicative Mood.

Present.

Huelo,	
Hueles,	
Huele,	*Huelen,*

Imperative Mood.

Huela,	
Huele,	
Huela,	*Huelan,*

Subjunctive Mood.

Present.

Huela,	
Huelas,	
Huela,	*Huelan,*

This verb changes as the preceding, and also takes *h* at the beginning of the irregular persons.

Parecer, to seem.

Past Participle: *parecido.* | Gerund: *pareciendo.*

Indicative Mood.

Present.

Parezco,	[No other Persons Irregular.]

Imperative Mood.

Parezca,	*Parezcamos,*
Parezca,	*Parezcan,*

Subjunctive Mood.

Present.

Parezca,	*Parezcamos,*
Parezcas,	*Parezcáis,*
Parezca,	*Parezcan,*

This verb, and all others ending in *acer, ecer*, and *ocer* (except *hacer* and *cocer*, and, of course, their compounds), take *z* before *c* of the verb-root, when the verb-ending begins with *a* or *o*. This can only occur in the first person singular of the present indicative, the first and third persons singular and plural of the imperative, and all the persons of the present subjunctive.

Poder, to be able.

Past Participle: *podido.* | Gerund: *pudiendo.*

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INDICATIVE MOOD.

Present.

Puedo,	
Puedes,	
Puede,	*Pueden,*

Perfect Definite.

Pude,	*Pudimos,*
Pudiste,	*Pudisteis,*
Pudo,	*Pudieron,*

First Future.

Podré,	*Podremos,*
Podrás,	*Podréis,*
Podrá,	*Podrán,*

IMPERATIVE MOOD.*

Pueda,	
Puede,	
Pueda,	*Puedan,*

SUBJUNCTIVE MOOD.

Present.

Pueda,	
Puedas,	
Pueda,	*Puedan,*

Imperfect.

Pudiera, podria, pudiese,	*Pudiéramos, podriamos, pudiésemos,*
Pudieras, podrías, pudieses,	*Pudiérais, podriais, pudieseis,*
Pudiera, podria, pudiese,	*Pudieran, podrían, pudiesen,*

First Future.

Pudiere,	*Pudiéremos,*
Pudieres,	*Pudiéreis,*
Pudiere,	*Pudieren,*

CORRESPONDENCE.

THE SABBATH.

'Twas He who in His power and might did call
All nature from the dark abyss, and form'd,
By His omnipotent decree alone, this hall
To roll in space, until its crust be storm'd
By fervent heat—that future blaze which shall
Consume the elements, which fast have stood
Since at Creation's birth both great and small
Appeared to their Creator "very good:"
'Twas He said this a day of rest should be,
That men might quench his thirst for things divine,
And gaze by faith into futurity.
O, Sacred Day! around our hearts entwine
A virtuous hope for all thy peaceful charms;
A hope to cheer and help us on our way,
Through fears, distresses, and this world's alarms;
An earnest he of Heaven's eternal day!
A foretaste of that everlasting love,
An antitype of all those sacred joys
Which to the full shall be enjoyed above,
And prove earth's pleasures vain and useless toys.

AMICUS.

CHRONOLOGY.—No. VIII.

A.D.
1194.—The motto "*Dieu et mon Droit*" first used by an English king (Richard I.).
1204.—The Inquisition instituted.
1208.—First charter granted to the City of London.
1215.—King John signs Magna Charta.
1225.—The English Parliament first exercises its right of granting public money to the king.
1230.—Union of the kingdoms of Leon and Castile.

* The imperative is inserted merely to exhibit the form, there being in fact, no imperative of *poder* in use.

A.D.
1258.—Bagdad captured by the Tartars.
1264.—The English House of Commons instituted.
1277.—Conquest of China by the Moguls.
1282.—Wales united to England. Great massacre of the French in Sicily, known as the "Sicilian Vespers."
1284.—Edward (afterwards Edward II.), first Prince of Wales, born at Caernarvon.
1287.—The Jews banished from England.
1292.—Edward I., chosen to settle the dispute about the heirs to the Scottish crown, confers it on John Baliol.
1295.—Conquest of Scotland by Edward I.
1320.—Battle of Bannockburn, in which the English are defeated, and Scottish independence re-asserted.
1334.—Woollen manufactures introduced into England.
1349.—Institution of the Order of the Garter.
1356.—Battle of Poictiers. The King of France and his son captured by Edward the Black Prince
1362.—Permission granted to employ the English language, instead of that of Norman French, in English law courts. John Wickliffe, the reformer, flourishes.
1388.—Battle of Otterburn, the subject of the famous "Chevy Chace" ballad.
1399.—Institution of the Order of the Bath.
1411.—St. Andrew's University founded.
1415.—The French defeated at the battle of Agincourt.
1430.—Printing invented about this year.
1446.—Vatican Library founded at Rome.
1453.—Constantinople captured by the Turks, and downfall of the Eastern Roman Empire.
1454.—Glasgow University founded.
1460.—Copper-plate printing invented about this year.
1461.—Edward IV. King of England.
1477.—Aberdeen University founded.
1483.—Duke of Gloucester, having murdered the young king Edward V., usurps the crown.
1485.—Richard III. (Duke of Gloucester) defeated and slain at the battle of Bosworth Field.
1485.—Henry VII., King of England, uniting the houses of York and Lancaster after a contest of more than thirty years.
1491.—The Moors subjugated by the Spaniards.
1492.—America discovered by Columbus.

ANSWERS TO CORRESPONDENTS.

J. D.—We have handed your letter to the editor of the "Quiver."

AN OLD SUBSCRIBER.—An article on etching will be given in an early number.

G. B.—On scientific grounds there is no reason to dispute the accuracy of the artist.

VOCAL.—Practice is the best mode of strengthening the voice. Stand to sing, stand erect, and open your mouth well.

A REGULAR SUBSCRIBER.—The music lessons by Mr. Curwen are completed.

F. VINER.—Decimal fractions differ from other fractions only in always having some power of 10 (that is, 1 followed by a number of 0's) for their denominator. They do not necessarily relate to inches, feet, or yards, any more than other fractions or whole numbers. ·3 means $\frac{3}{10}$, and ·01 means $\frac{1}{100}$. Surely there is no difficulty in understanding this. Though it may be hard to divide an inch into a hundred, a thousand, &c., equal parts, it is just as hard to comprehend distinctly thousands, hundreds of thousands, and millions of inches or anything else. A square inch is a surface one inch long and one inch broad. There is no such thing as a circle inch. The *contents*, not the *area*, of a cylinder is found by multiplying the area of its circular base or section into its height.

PINXIT.—The Royal Academy of Art was established in 1768. It was founded for the purpose of cultivating and improving the arts of painting, sculpture, and architecture. It has a fund for the encouraging and rewarding rising genius, and to defray the expenses of students during a limited stay at Rome. It has a collection of statues, models, &c., and a library, for the use of the students; who have also opportunities of drawing and modelling from life. It has an annual exhibition of pictures, models, drawings, &c., which has effected great good in the profession of artists, besides making the public acquainted with existing talent every year. For several years a portion of Somerset House, Strand, was occupied by this academy for its meetings, lectures, and exhibitions. A portion of the National Gallery, Trafalgar Square, is now devoted to this purpose, and it is probable that another alteration will soon be made.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXX.

(*Continued from page* 260.)

DYNAMICAL ELECTRICITY.

PHENOMENA OF INDUCTION.

Effects of Tension produced by Currents of Induction.—M. Ruhmkorff has lately constructed some very powerful bobbins, by means of which not only violent shocks may be produced by currents of induction, but also luminous effects very strongly resembling those of electrical machines of strong tension.

This apparatus consists of a strong bobbin B (fig. 465), placed vertically upon a thick plate of glass, which isolates it. The bobbin, which is about six inches high, is formed of two wires—one thick, about one-twelfth of an inch in diameter, and making three hundred turns; the other fine, being only about an eightieth of an inch in diameter, and rolled round the former ten thousand times. These wires are not only covered with silk, but each coil is isolated from the next by a layer of gum-lac varnish. It is the thick wire which is the inductor. The current which passes through it is simply that of a Bunsen battery. The positive pole of the battery being in connexion with the wire P R, the current passes through the conductor O to a cylinder O; thence it descends by a metallic part *g*, and reaches a copper plate *r*, which conducts it to one of the extremities *a* of the thick wire of the bobbin. The other end of the wire terminating at *i*, in one of the copper supports of the glass plate, the current, on leaving the bobbin, proceeds to a second plate *e*, whence it ascends in an iron column *u* A. There the current reaches an oscillating hammer *a* (fig. 466), which is sometimes in contact with a conductor *n*, and sometimes separated from it. When contact takes place, the current proceeds along the conductors *n* and *s* (fig. 465), as shown by the arrows, ascends into the cylinder *o*, and thence returns to the battery along the conductor *d* and the wire Q.

Fig. 465.

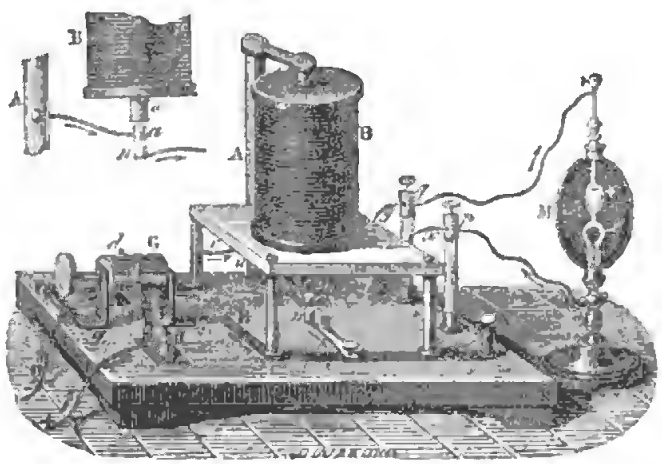


Fig. 466.

With regard to the motion of the hammer *a* backwards and forwards, that is produced by a soft iron cylinder *r o*, placed in the axis of the bobbin. When the current of the battery passes along the thick wire of the bobbin, this iron is magnetised, and draws up the hammer *a*—which is also iron—from below. The current then being interrupted, since it cannot pass through the part *n*, the cylinder *o r* loses its magnetic properties, and the hammer *a* falls down again. At this moment the current recommences, the hammer *a* is again raised, and so on continually.

As the current of the battery passes thus interruptedly along the thick wire of the bobbin, at each interruption a current of induction, successively direct and inverse, is produced in the thin wire. Now this latter being completely isolated, the induced current acquires so great a tension that it is capable of producing very intense luminous effects. For this purpose, the two ends of the fine wire, *q y* and *p x*, which come out from beneath the glass plate, are connected with the two rods attached to a globe M, such as has been already described under the title of the *electrical egg*, and is employed to observe the luminous effects of an electrical machine in a vacuum. Having produced a vacuum in the globe, a beautiful luminous trail is produced from one end to the other, apparently unbroken, and of the same intensity as is obtained with a powerful electrical machine, the plate of which is turned rapidly.

It is the positive pole of the induced current which exhibits most brightness. Its light is red, while that of the negative pole is feeble and of a violet colour, and extends throughout the whole length of the negative rod, a phenomenon which does not take place at the positive pole.

Messrs. Masson and Breguet made the first experiment to show that a bobbin of induction is capable of producing the physiological effects of the Leyden jar; but it was M. Ruhmkorff who first, having completely isolated the induced current by means of the above bobbin, was enabled to obtain from it electricity of any tension, and to produce effects of light such as have just been described.

Stratification of Electric Light.—In studying the electric light obtained from M. Ruhmkorff's bobbin of induction, M. Quet has lately observed, that if we do not produce a vacuum in the globe M (fig. 466), till after having introduced into it essence of turpentine, spirits of wine, etc., the appearance of the light is completely altered. It then appears under the form of a series of zones, alternately bright and dark, forming a sort of pile of electric light between the two poles (fig. 467).

In this experiment, it follows, from the discontinuity of the current of induction, that the light is not continuous, but consists of a series of discharges nearer to each other, in proportion as the hammer *a* (fig. 466) oscillates more rapidly. The luminous zones then appear affected with a rapid double-revolving and undulatory motion. M. Quet considers this motion as an optical illusion, because, if the hammer be made to oscillate slowly with the hand, the zones appear very distinct and fixed; but the phenomenon is then too instantaneous to allow the undulations to be perceived, if there are any.

The light of the positive pole is, as we have said, generally red, and that of the negative pole violet; but the colour varies with the vapour or gas which is in the globe.

M. Despretz has lately observed that the phenomena established by Messrs. Ruhmkorff and Quet with a discontinuous current may be produced with an ordinary continuous current, but with this important difference, that the continuous current requires a great number of Bunsen couples, while the

discontinuous current of M. Ruhmkorff's bobbin requires only one. It is a remarkable fact, established by experiment, that the intensity of the effects of this bobbin increases very little when the number of Bunsen couples is increased.

Fig. 467.



The theory of the phenomena of the stratification of electric light in vapours, and the colouring of the poles, is not yet ascertained satisfactorily.

Characters of Currents of Induction.—From the various experiments upon currents of induction to which we have called the reader's attention, we see that, in spite of their instantaneous duration, they possess all the properties of ordinary voltaic currents. Like them, they produce violent physiological, luminous, calorific, and chemical effects, and themselves give rise to fresh induced currents. Lastly, they deflect the needle of galvanometers and magnetise steel bars, when they are passed along a copper wire wound round these bars in the form of a helix (fig. 452).

The shock of induced currents is much more intense than that of hydro-electric currents. The latter, indeed, do not give any shock except with a large number of couples, while a single Bunsen couple, with the bobbin, above described (figs. 466 and 461), produces induced currents, the shock of which is insupportable and even dangerous when prolonged.

The shock is entirely owing to the direct current, that is to say, to that which is produced when the current in the inducing wire is interrupted.

The intensity of the shock of induced currents renders their effects like that of electricity in a state of tension. However, as they always act upon the galvanometer, it is probable that in the wires subjected to induction, there is electricity both in a state of tension and in a dynamical state.

The direct and inverse induced currents have been compared together in three points of view: the violence of the shock, the magnitude of the deflection in the galvanometer, and the magnetising action upon steel bars. Thus examined, these currents exhibit very different results. They appear nearly equal in respect of the deflection of the galvanometer, while the shock of the direct current being very violent, that of the inverse current is almost imperceptible. There is the same difference with regard to the magnetising power. The direct current magnetises powerfully, but the inverse current does not magnetise at all.

PRACTICAL APPLICATIONS OF THE GALVANIC BATTERY.

Electric Telegraphs.—We now come to a subject in which all are interested, and with which all are in some degree familiar, though comparatively few understand it thoroughly. Of all the scientific marvels wrought in this remarkable century, there is none more astounding than the electric telegraph, which enables us to convey communications to persons hundreds of miles off with all the rapidity of the lightning flash, whether they be in the same country or separated from us by miles of ocean waves. This achievement eclipses all the wonders accomplished by the application of steam, and is in itself sufficient to render the present century for ever memorable in the annals of our race.

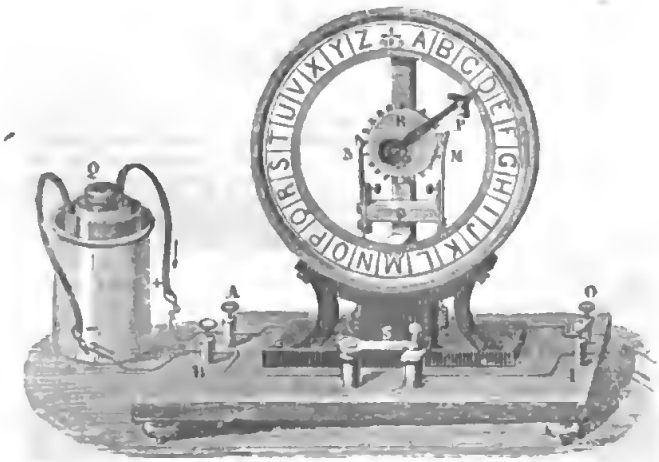
Electric telegraphs, we need scarcely say, are apparatus which serve for the transmission of messages to great distances, by means of voltaic currents along metallic wires. Even last century, philosophers had entertained the idea of corresponding at great distances by means of the effects produced by the electricity of electrical machines, and propagated along conducting wires.

In 1814, Sœmmering invented a telegraph based upon the decomposition of water by the battery, which he employed as a means of indicating signals. In 1820, at a time when the electro-magnet was not known, Ampère, guided by Œrsted's experiment, proposed to correspond by means of magnetised needles, above which a current was directed, employing as many needles and as many wires as there are letters in the alphabet. In 1837, M. Steinheil, at Munich, and Professor Wheatstone, in London, constructed telegraphs with several wires, each acting upon a magnetised needle, the source of the current being a Clarke's electro-magnetic apparatus, or a hydro-electrical battery. But the telegraph could not be made simple enough, till Professor Wheatstone, in 1840, introduced the use of electro-magnets.

Without altering the principle of the electric telegraph, its form has been much changed; but all the forms may be referred to three classes—the dial telegraph, the signal telegraph, and the writing telegraph. We proceed to give some account of each of these varieties.

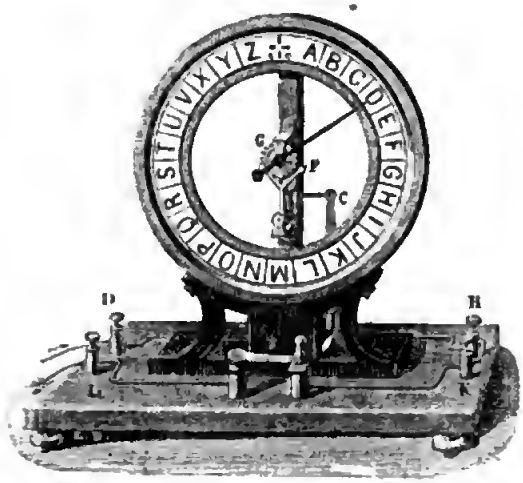
The Dial Telegraph.—There are several sorts of dial tele-

Fig. 68.



graphs. That which is represented in figs. 468 and 469 was constructed by M. Froment, and our drawings were made in June, 1850. M. Froment's telegraph is the same in principle as those employed on railways. Like them, it consists of two distinct apparatus, one called the *manipulator*, for transmitting signals, and the other the *receiver*, for receiving signals. The former is connected with a carbon pile or battery o, and the two apparatus are connected together by means of two metallic wires, either iron or copper, the former of which goes from

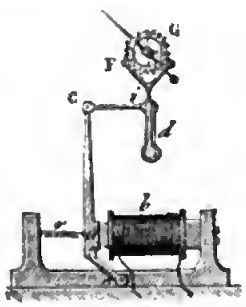
Fig. 469.



the starting-point to the distant station, and the latter from the distant station to the point of departure. Lastly, each apparatus is furnished with a dial containing twenty-four letters, and a needle moveable upon the dial. It is the experimenter's hand which moves the needle at the point of departure, but it is the electricity which turns that at the distant station.

The following is the course of the current in the two apparatus and the effects which it produces. From the battery it proceeds along a copper wire A (fig. 468) to a piece of brass N in contact with a metallic wheel R, passes into a second piece M, and then into the wire O, which joins the other station. There the current goes into the bobbin of an electro-magnet *b*, concealed in fig. 469, but represented in profile in fig. 470,

Fig. 470.



which shows the hinder part of the apparatus. This electro-magnet is fixed horizontally at one of its extremities, and by the other it attracts a soft iron armature *a*, which forms part of a bent lever moveable about its point of support a, while a coiled spring tends to move the lever in the contrary direction.

When the current passes, the electro-magnet attracts the lever *a* c, which, by means of a rod *i*, acts upon a second lever *d* fixed to a horizontal axis, which is itself attached to a fork *r*. When the current is interrupted, the spring *r* draws back the lever *a* c, and with it all the parts of the apparatus depending upon it. The result of this is a motion backwards and forwards, which is communicated to the fork *r*, which transmits it to a ratchet-wheel o, the axis of which carries the indicating needle or pointer. The teeth of the wheel are so bent that it is always moved in the same direction by the fork, which is indispensable to the usefulness of the apparatus.

To understand the intermissions of the electro-magnet, we have recourse to fig. 468. The wheel R has twenty-six teeth, twenty-five of which correspond to letters of the alphabet, and the last to the interval reserved between the letters A and Z. When, by holding the button P in the hand, you turn the wheel R, the end of the piece N is, by its curvature, always in contact with the teeth. The piece M, on the contrary, has a cog at the end, cut in such a way that there is contact and interruption of contact in succession. Consequently, the communications with the battery being established, if you move forward the needle P four letters, for example, the current passes four times from N to M, and is interrupted four times. The electro-magnet of the distant station will therefore become attractive four times, and will cease to be so four times. Consequently, at last the wheel O will have turned four teeth, and as each tooth corresponds to a letter, the needle of the distant station will have gone over exactly the same number of letters as that at the station of departure, With regard to the part e, represented in both figures, it is a piece of copper moveable upon a hinge, and serving to interrupt the current or close it at will.

From what has been stated, it is easy to understand how correspondence is carried on from one place to another at a distance. Suppose, for example, the first apparatus (fig. 468) to be in London, and the second (fig. 469) at Birmingham, and the communication between the two stations being established by means of wires, we wish to transmit from London to Birmingham the word *signal*. The needles of the two apparatus being both at the interval between A and Z, the person who sends the despatch moves forward the needle P to the letter S, where it stops for a very short time; the needle of the apparatus at Birmingham, faithfully following the movements of the needle in London, stops at the same letter, and then the person who receives the despatch marks this letter. He who is in London, continuing to turn the needle always in the same direction, stops the needle at the letter I, and the other needle instantly stops at the same letter. Proceeding in the same manner for the letters G N A L, the whole word is soon transmitted to Birmingham.

To call the attention of the person to whom we are about to make a communication, a bell is fitted up at the distant station, and is connected with the current whenever the correspondence is suspended. A trigger, moved by the electro-magnet, rings this bell directly the current passes, and thus gives a signal that a message is about to be communicated. Further, each station ought to be provided with the two apparatus above described (figs. 468 and 469), otherwise it will be impossible to return an answer.

We have supposed that the current which goes from London to Birmingham returns in the same way from Birmingham to London. But this second wire is useless. Experience has shown that, if the positive pole in London is connected with the apparatus, and the negative pole with the earth, it is sufficient for the conducting wire which goes to Birmingham to be there connected with the earth. It is generally believed that the circuit is then closed by the earth through which the current returns from Birmingham to London. This hypothesis has been severely criticised by some philosophers, particularly by the Abbé Moigno, in his treatise on the electric telegraph. And indeed it is difficult to conceive that, on its arrival at Birmingham, the current, which by its nature tends to disperse in all directions, should choose precisely that which takes it back to the battery whence it started. M. Moigno considers that the earth, acting in this case as a reservoir, absorbs at the two ends of the wires the electricity which the battery transmits, and the consequence is, that there is the same continuous current in the wire as if the two ends touched each other.

L'objet de la science est de connaître la vérité; son occupation, de la rechercher; son caractère, de l'aimer: les moyens de l'acquérir sont de renoncer aux passions, de fuir la dissipation et l'oisiveté.—*J. J Rousseau.*

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BIOGRAPHY.—No. XXI.

GOLDSMITH.

By J. R. Beard, D.D.

Oliver Goldsmith is one of the few pets of literature. Having failings and faults neither few nor small, he is always regarded with interest, and spoken of with pity rather than blame. If this charity resulted from gratitude for the instruction and pleasure conveyed in his writings, we should regard it as a sort of allowable offset paid by gratitude. But we fear the sentiment is allied to a toleration of the kind of errors of which Goldsmith was guilty, and which made the plague of his existence. Improvidence and moral infirmity are defects of character too serious to be glossed over even by qualities as amiable as the better points in Goldsmith's life. Perhaps the existence of such goodness ought to make the moral censor the more rigid, because it is great excellence which those evil habits tarnish or almost destroy. Nor is it possible to think of the numerous and severe penalties which Goldsmith's faults inflicted on him without combining detestation of the sin with commiseration for the sinned. Amiable Goldsmith always was; but for his want of forethought and moral fortitude, he would have been pre-eminently good and great.

Goldsmith, distinguished alike in prose and poetry, was born on the 10th of November, 1728, in the county of Longford, Ireland, of whose sons, in their want of thrift and their superabundance of buoyancy, he is no unfit representative. His father, a clergyman, desirous that his son should follow his own profession, sent him to the university of Dublin, a relative bearing the cost (1745). A life of trouble began with bickerings. Goldsmith fell out with his tutor, to whom he was reconciled by his brother. With a wandering disposition, he bethought him of emigrating to America; but, destined to miss all his days, he missed his passage. He had no resource but to return to the parental roof. Theology having been abandoned, he thence proceeded to Edinburgh in order to study medicine. For the same purpose he repaired to the university of Leyden. The way back was not easy, for his money was all spent. However he had a flute, and he could play thereon. With this resource he passed through Flanders, France and Germany into Switzerland, where he wrote a part of his poem, "The Traveller." In Geneva he had the good fortune to be made tutor to a young Englishman.

Leaving his pupil at Marseilles, he turned his steps to Padua, in whose university he graduated as doctor of medicine. In the year 1756 he returned to England, and under the pressure of want took an ushership in a school at Peckham, and then became a druggist's assistant. At length, encouraged by a college friend, he offered his services as a physician in London. Without practice and without money, he connected himself with "The Monthly Review," and so began a literary career out of which he was to gather an uncertain subsistence and an undying renown. He began his new mode of life with his "Enquiry into the Present State of Taste and Literature in Europe" (1759), a wide subject for a young man, and a difficult one for an unpractised pen. Among other less considerable compositions, he published in "The Public Ledger" his Chinese letters, under the title of "The Citizen of the World" (1762). About the same time he finished "The Traveller" (1765), which was followed by the "Letters on English History" (1765), and his delightful "Vicar of Wakefield," (1766). The next year appeared his first theatrical piece, "The Good-natured Man." Then came that sweet poem, "The Deserted Village" (1770), as full of bad philosophy as it is of good sentiment. Very readable compilations, entitled, "A History of England" (1772), a "Roman History," a "History of Greece," and a "History of the Earth and Animated Nature" (1774), were prepared for the booksellers. Meanwhile he had put forth (1773) his second and still popular play, "She stoops to conquer" (alas! poor Noll stooped but did not conquer; how different the result, had he resolved to conquer without stooping!) These productions were a heavy tax on a frame never very robust. Yet more serious labours were in contemplation. He was engaged with the plan of a general Dictionary of Art and Science, when he was relieved from his load by the hand of death (4th of April, 1774). The prize among his prose writings at least belongs to the "Vicar of Wakefield," a tale which, notwithstanding what critics have said, has become a favourite with the civilised world.

Washington Irving, who published an edition of Goldsmith's "Miscellaneous Works," has written a charming sketch of his life. The rich materials accumulated by Prior in his "Life of Oliver Goldsmith" (1837), have been wrought into an admirable biography by Forster, in "The Life and Adventures of Oliver Goldsmith" (1848). In "Cassell's Illustrated Goldsmith" will be found a graphic memoir of the author, and the best of his prose and poetical works.

THE VILLAGE INN.

Near yonder thorn that lifts its head on high,
Where once the sign-post caught the passing eye,
Low lies that house where nut-brown draughts inspired,
Where gray-beard mirth and smiling toil retired;
Where village statesmen talked with looks profound,
And news much older than their ale went round;
Imagination fondly stoops to trace
The parlour splendours of that festive place;
The white-washed wall, the nicely sanded floor,
The varnished clock that clicked behind the door;
The chest contrived a double debt to pay,
A bed by night, a chest of drawers by day;
The pictures placed for ornament and use,
The twelve good rules, the royal game of goose:
The hearth, except when winter chilled the day,
With aspen boughs and flowers and fennel gay;
While broken tea-cups, wisely kept for show,
Ranged o'er the chimney, glistened in a row.
Vain, transitory splendour! could not all
Reprieve the tottering mansion from its fall?
Obscure it sinks, nor shall it more impart
An hour's importance to the poor man's heart.
Thither no more the peasant shall repair,
To sweet oblivion of his daily care;
No more the farmer's news, the barber's tale,
No more the woodman's ballad shall prevail;
No more the smith his dusky brow shall clear,
Relax his ponderous strength and lean to hear:
The host himself no longer shall be found
Careful to see the mantling bliss go round;
Nor the coy maid, half willing to be pressed,
Shall kiss the cup to pass it to the rest.
Yes! let the rich deride, the proud disdain,
These simple blessings of the lowly train;
To me more dear, congenial to my heart,
One native charm, than all the gloss of art.
Spontaneous joys, where nature has its play,
The soul adopts, and owns their first-born sway.
Lightly they frolic o'er the vacant mind,
Unenvied, unmolested, unconfined.
But the long pomp, the midnight masquerade,
With all the freaks of wanton wealth arrayed,
In these, ere triflers half their wish obtain,
The toiling pleasure sickens into pain;
And even while fashion's brightest arts decoy,
The heart distrusting asks, if this be joy?
Ye friends to truth, ye statesmen who survey
The rich man's joys increase, the poor's decay,
'Tis yours to judge how wide the limits stand
Between a splendid and a happy land.
Proud swells the tide with loads of freighted ore,
And shouting folly hails them from her shore;
Hoards even beyond the miser's wish abound,
And rich men flock from all the world around.
Yet count our gains. This wealth is but a name,
That leaves our useful product still the same.
Not so the loss. The man of wealth and pride
Takes up a space that many poor supplied;
Space for his lake, his parks extended bounds,
Space for his horses, equipage, and hounds;
The robe that wraps his limbs in silken sloth,
Has robbed the neighbouring fields of half their growth;
His seat, where solitary sports are seen,
Indignant spurns the cottage from the green;
Around the world each needful product flies,
For all the luxuries the world supplies.
While thus the land adorned for pleasure all,
In barren splendour feebly waits the fall.
As some fair female, unadorned and plain,
Secure to please while youth confirms her reign,

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Slights every borrowed charm that dress supplies,
Nor shares with art the triumph of her eyes;
But when those charms are past, for charms are frail,
When time advances, and when lovers fail,
She then shines forth, solicitous to bless,
In all the glaring impotence of dress:
Thus fares the land, by luxury betrayed,
In nature's simplest charms at first arrayed;
But verging to decline, its splendours rise,
Its vistas strike, its palaces surprise:
While, scourged by famine, from the smiling land
The mournful peasant leads his humble hand;
And while he sinks, without one arm to save,
The country blooms—a garden and a grave.—GOLDSMITH.

THE GIANT AND THE DWARF.

'Once upon a time, a Giant and a Dwarf were friends, and kept together. They made a bargain that they would never forsake each other, but go and seek adventures. The first battle they fought was with two Saracens, and the Dwarf, who was very courageous, dealt one of the champions a most angry blow. It did the Saracen but very little injury, who lifting up his sword fairly struck off the poor Dwarf's arm. He was now in a woful plight; but the Giant coming to his assistance, in a short time left the two Saracens dead on the plain, and the Dwarf cut off the dead man's head out of spite. They then travelled on to another adventure. This was against three bloody-minded Satyrs, who were carrying away a damsel in distress. The Dwarf was not quite so fierce now as before, but for all that struck the first blow; which was returned by another, that knocked out his eye: but the Giant was soon up with them, and had they not fled, would certainly have killed them every one. They were all very joyful for this victory, and the damsel, who was relieved, fell in love with the Giant, and married him. They now travelled far and farther than I can tell, till they met with a company of robbers. The Giant for the first time was foremost now, but the Dwarf was not far behind. The battle was stout and long. Wherever the Giant came, all fell before him; but the Dwarf had like to have been killed more than once. At last the victory declared for the two adventurers; but the Dwarf lost his leg. The Dwarf had now lost an arm, a leg, and an eye, while the Giant was without a single wound. Upon which he cried out to his little companion: 'My little hero, this is glorious sport; let us get one victory more, and then we shall have honour for ever.'—'No,' cries the Dwarf, who was by this time grown wiser; 'no, I declare off; I'll fight no more; for I find in every battle that you get all the honour and rewards, but all the blows fall upon me.'"

THEORY AND PRACTICE OF TEACHING.

No. I.

SPIRIT OF THE TEACHER

PERHAPS the very first question that the honest individual will ask himself, as he proposes to assume the teacher's office, or to enter upon a preparation for it, will be—"*What manner of spirit am I of?*" No question can be more important. We would by no means undervalue that degree of natural talent, of mental power, which all justly consider so desirable in the candidate for the teacher's office. But the *true spirit of the teacher*,—a spirit that seeks not pecuniary emolument alone, but desires to be in the highest degree useful to those who are to be taught; a spirit that elevates above every thing else the nature and capabilities of the human soul, and that trembles under the responsibility of attempting to be its educator; a spirit that looks upon gold as a contemptible dross of earth, when compared with that imperishable gem which is to be polished and brought out into heaven's light to shine for ever; a spirit that scorns all the rewards of earth, and seeks that highest of all rewards, an approving conscience and an approving God; a spirit that earnestly enquires what is right, and that dreads to do what is wrong; a spirit that can recognise and reverance the handiwork of God in every child, and that burns with the desire to be instrumental in training it to the highest attainment of which it is capable,—*such a spirit* is the first thing to be sought by the teacher, and without it the highest talent cannot make him truly excellent in his profession.

The candidate for the office of the teacher should look well to his motives. It is easy to enter upon the duties of the teacher without preparation; it is easy to do it without that lofty purpose which an enlightened conscience would ever demand; but it is not so easy to undo the mischief which a single mistake may produce in the mind of the child, at that tender period when mistakes are most likely to be made.

Too many teachers are found in our schools without the spirit for their work which is here insisted on. They not only have not given attention to any preparation for their work, but resort to it from motives of personal convenience, and in many instances from a consciousness of being unfit for every thing else! In other professions this is not so. The lawyer is not admitted to the bar till he has pursued a course of thorough preparation, and even then but warily employed. The physician goes through his course of reading and his course of lectures, and often almost through a *course of starvation* in the country village where he first takes up his abode, before he is called in to heal the maladies of the body. It is long before he can inspire confidence enough in the people to be intrusted with their most difficult cases of ailing, and very likely the noon of life is passed before he can consider himself established. But it is not so with the teacher. He gains access to the sanctuary of mind without any difficulty, and the most tender interests for both worlds are intrusted to his guidance, even when he makes pretension to no higher motive than that of filling up a few months of time not otherwise appropriated, and to no qualifications but those attained by accident. A late writer in the "Journal of Education" hardly overstates this matter:—"Every stripling who has passed four years within the walls of a college; every dissatisfied clerk, who has not ability enough to manage the trifling concerns of a common retail shop; every young farmer who obtains in the winter a short vacation from the toils of summer,—in short, every young person who is conscious of his imbecility in other business, esteems himself fully competent to train the ignorance and weakness of infancy into all the virtue and power and wisdom of maturer years,—to form a creature, the frailest and feeblest that heaven has made, into the intelligent and fearless sovereign of the whole animated creation, the interpreter and adorer and almost the representative of Divinity!"

Many there are who enter upon the high employment of teaching a common school as a *secondary* object. Perhaps they are students themselves in some higher institution, and resort to this as a temporary expedient for paying their board, while their chief object is, to pursue their own studies and thus keep pace with their classes. Some make it a stepping-stone to something beyond, and, in their estimation, higher in the scale of respectability,—treating the employment, while in it, as irksome in the extreme, and never manifesting so much delight as when the hour arrives for the dismissal of their schools. Such have not the true spirit of the teacher; and if their labours are not entirely unprofitable, it only proves that children are sometimes submitted to imminent danger, but are still unaccountably preserved by the hand of Providence.

The teacher should go to his duty full of his work. He should be impressed with its overwhelming importance. He should feel that his mistakes, though they may not speedily ruin him, may permanently injure his pupils. Nor is it enough that he shall say, "I did it ignorantly." He has assumed to fill a place where ignorance itself is sin; and where indifference to the well-being of others is equivalent to wilful homicide. He might as innocently assume to be the physician, and, without knowing its effects, prescribe arsenic for the colic. Ignorance is not in such cases a valid excuse, because the assumption of the place implies a pretension to the requisite skill. Let the teacher, then, well consider what manner of spirit he is of. Let him not come to this work until he has carefully pondered its nature and its responsibilities, and has devoted his best powers to a thorough preparation of himself for its high duties. Above all, let him be sure that his motives on entering the school-room are such as will be acceptable in the sight of God, when viewed by the light beaming out from his throne.

"Oh! let not then unskilful hands attempt
To play the harp whose tones, whose living tones

Are left for ever in the strings. Better far
That heaven's lightnings blast his very soul,
And sink it back to Chaos' lowest depths,
Than knowingly, by word or deed, he send
A blight upon the trusting mind of youth.

RESPONSIBILITY OF THE TEACHER.

It is the object of the following remarks feebly to illustrate the extent of the teacher's responsibility. It must all along be borne in mind that he is not *alone* responsible for the results of education. The parent has an overwhelming responsibility, which he can never part with or transfer to another while he holds the relation of parent.

But the teacher is responsible in a very high degree. An important interest is committed to his charge whenever a human being is placed under his guidance. By taking the position of the teacher, all the responsibility of the relation is voluntarily assumed; and he is fearfully responsible not only for what he *does*, but also for what he neglects to do. And it is a responsibility from which he cannot escape. Even though he may have thoughtlessly entered upon the relation of teacher, without a single glance at its obligations; or though, when reminded of them, he may laugh at the thought, and disclaim all idea of being seriously held to a fearful account,—yet still *the responsibility is on him*. Just as true as it is a great thing to guide the mind aright,—just as true as it is a deplorable, nay, fatal thing to lead it astray, so true is it, that he who attempts the work, whether ignorant or skilful, whether thoughtless or serious, incurs all the responsibility of success or failure,—a responsibility he can never shake off as long as the human soul is immortal, and men are accountable for such consequences of their acts as are capable of being foreseen.

The teacher is in a degree responsible for the BODILY HEALTH *of the child.* It is well established that the foundation of many serious diseases is laid in the school-room. These diseases come sometimes from a neglect of exercise; sometimes from too long confinement in one position, or upon one study; sometimes from over-excitement and over-study; sometimes from breathing bad air; sometimes from being kept too warm or too cold. Now the teacher should be an intelligent physiologist; and from a knowledge of what the human system can bear and what it cannot, he is bound to be ever watchful to guard against all those abuses from which our children so often suffer. Especially should he be tremblingly alive to avert that excitability of the nervous system, the over-action of which is so fatal to the future happiness of the individual. And should he, by appealing to the most exciting motives, encourage the delicate child to press on to grasp those subjects which are too great for its comprehension, and allow it to neglect exercise in the open air in order to task its feverish brain in the crowded and badly ventilated school-room; and then, in a few days, be called to look upon the languishing sufferer upon a bed of exhaustion and pain—perhaps a bed of premature death,—could he say, "I am not responsible?" Parents and teachers often err in this. They are so eager to develope a precocious intellect, that they crush the casket in order to gratify a purient desire to astonish the world with the brilliancy of the gem. Each is responsible for his share of this sin; and the teacher especially, because by his education he should know better.

The teacher is mainly responsible for the INTELLECTUAL GROWTH *of the child.* This may be referred chiefly to the following heads:—

1. *The order of study.* There is a natural order in the education of the child. The teacher should know this. If he presents the subjects out of this order, he is responsible for the injury. In general, the *elements* should be taught first. Those simple branches which the child first comprehends, should first be presented. *Reading*, of course, must be one of the first; though we think the day is not distant when an enlightened community will not condemn the teacher, if, while teaching reading, he should call the child's attention by oral instructions to such objects about him as he can comprehend, even though in doing this he should somewhat prolong the time of learning to read. It is indeed of little consequence that the child should read *words* simply; and that teacher may be viewed as pursuing the order of nature, who so endeavours to develope the powers of observation and comparison, that words when learnt may be the vehicles of ideas.

Next to Reading and its inseparable companions—*Spelling* and *Defining*—we are inclined to recommend the study of *Mental Arithmetic*. The idea of Number is one of the earliest in the mind of the child. He can be taught to count early, and quite early to perform those operations which we call adding, subtracting, multiplying and dividing. This study at first *needs no book*. The teacher should be thoroughly versed in Mental Arithmetic, and he will then find enough to interest the child. When the scholar has learnt to read, and has attained the age of six or seven, he may be allowed a book in *preparing his lesson*, but never during the recitation. Those who have not tried this kind of mental discipline, will be astonished at the facility which the child acquires for performing operations that often puzzle the adult. Nor is it an unimportant acquisition. None can tell its value but those who have experienced the advantage it gives them in future school exercises and in business over those who have never had such training.

Geography may come next to Mental Arithmetic. The child should have an idea of the relations of size, form and space, as well as number, before commencing Geography. These, however, he acquires naturally at an early age; and very thoroughly, if the teacher has taken a little pains to aid him on these points in the earliest stages of his progress. A map is a picture, and hence a child welcomes it. If it can be a map of some familiar object, as of his school-room, of the school district, of his father's orchard, or farm, it becomes an object of great interest. A map of his town is very desirable, also of his county and his own country.

History should go hand in hand with Geography. Perhaps no greater mistake is made than that of deferring History till one of the last things in the child's course.

Writing may be early commenced with the *pencil* upon the slate, because it is a very useful exercise to the child in prosecuting many of his other studies. But writing with a pen may well be deferred till the child is *ten years of age*, when the muscles shall have acquired sufficient strength to grasp and guide it.

Written Arithmetic may succeed the mental; indeed, it may be practised along with it.

Composition—perhaps by another name, as *Description*—should be early commenced and very frequently practised. The child can be early interested in this, and he probably in this way acquires a better knowledge of practical grammar than in any other.

Grammar, in our opinion, as a study, should be one of the last of the common school branches to be taken up. It requires more maturity of mind to understand its relations and dependences than any other; and that which is taught of grammar without such an understanding, is a mere smattering of *technical terms*, by which the pupil is injured rather than improved. It may be said, that unless scholars commence this branch early, they never will have the opportunity to learn it. Then let it go unlearned; for as far as we have seen the world, we are satisfied that this early and superficial teaching of a difficult subject is not only useless but positively injurious. How many there are who study grammar for years, and then are obliged to confess in after life, because "their speech bewrayeth" them, that they never understood it! How many, by the too early study of an intricate branch, make themselves *think* they understand it, and thus prevent the hope of any further advancement at the proper age! *Grammar, then, should not be studied too early.*

Of the manner of teaching all these branches, we may have more to say hereafter. At present we have only noticed *the order* in which they should be taken up. This is a question of much consequence to the child, and the teacher is generally responsible for it. He should therefore carefully consider this matter, that he may be able to decide aright.

2. *The manner of study.* It is of quite as much importance *how* we study, as *what* we study. Indeed we have thought that much of the difference among men could be traced to their different habits of study, formed in youth. A large portion of our scholars study for the sake of preparing to recite the lesson. They seem to have no idea of any object beyond *recitation*. The consequence is, they study mechanically.

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They endeavour to remember phraseology, rather than principles; they study the *book*, not the subject. Let any one enter our schools and see the scholars engaged in preparing their lessons. Scarcely one will be seen, who is not repeating over and over again the words of the text, as if there was a savin charm in repetition. Observe the same scholars at recitation, and it is a struggle of the memory to recall the forms of *words*. The vacant countenance too often indicates that they are words without meaning. This difficulty is very much increased, if the teacher is confined to the text-book during recitation; and particularly, if he relies mainly upon the *printed questions* so often found at the bottom of the page.

The scholar should be encouraged to *study the subject;* and his book should be held merely as the instrument. "Books are but helps," is a good motto for every student. The teacher should often tell how the lesson should be learned. His precept in this matter will often be of use. Some scholars will learn a lesson in one-tenth of the time required by others. Human life is too short to have any of it employed to disadvantage. The teacher, then, should inculcate such habits of study as are valuable; and he should be particularly careful to break up, in the recitations, those habits which are so grossly mechanical. A child may almost be said to be educated, who has learned to study aright; while one may have acquired in the mechanical way a great amount of knowledge, and yet have no profitable mental discipline.

For this difference in children, as well as in men, the teacher is more responsible than any other person. Let him carefully consider this matter.

3. *Collateral study.* Books, to be sure, are to be studied, and studied *chiefly*, in most of our schools. But there is much for the teacher to do towards the growth of the mind, which is not to be found in the school-books; and it is the practical recognition of this fact which constitutes the great difference in teachers. *Truth*, in whatever department, is open to the faithful teacher. And there is such a thing, even in the present generation, as "opening the eyes of the blind," to discover things new and old, in nature, in the arts, in history, in the relation of things. Without diminishing, in the least, the progress of the young in study, their powers of observation may be cultivated, their perception quickened, their relish for the acquisition of knowledge indefinitely increased, by the instrumentality of the teacher. This must of course be done adroitly. There is such a thing as excessively cramming the mind of a child, till he loathes everything in the way of acquisition. There is such a thing, too, as exciting an all pervading interest in a group of children, so that the scholar shall welcome the return of school hours, and, by his cheerful step and animated eye, as he seeks the school-house, disclaim, as false when applied to him, the language of the poet, who described the school-boy of his darker day,—

> "with his satchel,
> And shining morning face, creeping, *like snail*,
> *Unwillingly* to school."

The teacher, who is responsible for such a result, should take care to store his own mind with the material, and exercise the ingenuity, to do that which is of so much consequence to the scholar.

The teacher is in a degree responsible for the MORAL TRAINING *of the child.*

We say *in a degree*, because it is confessed that in this matter very likely much depends upon parental influence.

This education of the heart is confessedly too much neglected in all our schools. It has often been remarked that "knowledge is power," and as truly, that "knowledge without principle to regulate it may make a man a powerful villain!" It is all-important that our youth should early receive such moral training, as shall make it safe to give them knowledge. Very much of this work must devolve upon the teacher; or rather, when he undertakes to teach, he *assumes* the responsibility of doing or of neglecting this work.

The *precept* of the teacher may do much towards teaching the child his duty to God, to himself, and to his fellow-beings. But it is not mainly by precept that this is to be done. Sermons and homilies are but little heeded in the school-room; and unless the teacher has some other mode of reaching the feelings and the conscience, he may despair of being successful in moral training.

The teacher should be well versed in human nature. He should know the power of conscience and the means of reaching it. He should himself have deep principle. His *example* in everything before his school should be pure, flowing out from the purity of his soul. He should ever manifest the tenderest regard to the law of right and of love. He should never violate his own sense of justice, nor outrage that of his pupils. Such a man teaches by his example. He is a "living epistle, known and read of all." He teaches, as he goes in and out before the school, as words can never teach.

The moral feelings of children are capable of systematic and successful cultivation. Our muscles acquire strength by use: it is so with our intellectual and moral faculties. We educate the power of calculation by continued practice, so that the proficient adds the long column of figures almost with the rapidity of sight, and with infallible accuracy. So with the moral feelings. "The more frequently we use our conscience," says Dr. Wayland, "in judging between actions, as right and wrong, the more easily shall we learn to judge correctly concerning them. He who, before every action, will deliberately ask himself, 'is this right or wrong?' will seldom mistake what is his duty. And children may do this as well as grown persons." Let the teacher appeal as often as may be to the pupil's conscience. In a thousand ways can this be done, and it is a duty the faithful teacher owes to his scholars.

By such methods of cultivating the conscience as the judicious teacher may devise, and by his own pure example, what may he not accomplish? If he loves the truth, and ever speaks the truth; if he is ever frank and sincere; if, in a word, he shows that he has a tender conscience in all things, and that he always refers to it for its approval in all his acts,—what an influence does he exert upon the impressible minds under his guidance! How those children will observe his consistent course; and though they may not speak of it, how great will be its silent power upon the formation of their characters! and in future years, when they ripen into maturity, how will they remember and bless the example they shall have found so safe and salutary!

Responsibility in this matter cannot be avoided. The teacher by his example *does teach*, for good or for evil, whether he will or not. Indifference will not excuse him; for when most indifferent he is not less accountable. And if his example be pernicious, as too often even yet the example of the teacher is; if he indulges in outbreaks of passion, or wanders in the mazes of deceitfulness; if the blasphemous oath pollutes his tongue; or the obscene jest poisons his breath; if he trifles with the feelings or the rights of others, and habitually violates his own conscience,—what a blighting influence is his for all coming time!

With all the attachment which young pupils will cherish even towards a bad teacher, and with all the confidence they will repose in him, who can describe the mischief which he can accomplish in one short term? *The school is no place for a man without principle;* we repeat, THE SCHOOL IS NO PLACE FOR A MAN WITHOUT PRINCIPLE. Let such a man seek a livelihood anywhere else; or, failing to gain it by other means, let starvation seize the body, and send the soul back to its Maker as it is, rather than he should incur the fearful guilt of poisoning youthful minds and dragging them down to his own pitiable level. If there can be one sin greater than another, on which Heaven frowns with more awful displeasure, it is that of leading the young into principles of error and the debasing practices of vice.

> "Oh, woe to those who trample on the mind,
> That deathless thing! They know not what they do,
> Nor what they deal with. Man, perchance, may bind
> The flower his step hath bruised; or light anew
> The torch he quenches; or to music wind
> Again the lyre-string from his touch that flew;—
> But for the soul, oh! tremble and beware
> To lay rude hands upon God's mysteries there!"

Let, then, the teacher study well his motives when he enters this profession, and so let him meet his responsibility in this matter as to secure the approval of his own conscience and his God.

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The teacher is to some extent responsible for the RELIGIOUS TRAINING *of the young.*

We live in a Christian land. It is our glory, if not our boast, that we have, as a nation, long feared God and reverenced his word. Very justly we attribute our superiority as a people over those who dwell in the darker portions of the world, to our purer faith derived from that precious fountain of truth—the Bible. Very justly, too, does the true patriot and philanthropist rely upon our faith and practice as a Christian people for the permanence of our free institutions and our unequal social privileges.

If we are so much indebted, then, to the Christian religion for what we are, so much dependent upon its life-giving truths for what we may hope to be,—how important is it that all our youth should be nurtured under its influences!

When we say religious training, we do not mean sectarianism. In our public schools, supported at the public expense, and in which the children of all denominations meet for instruction, we do not think that any man has a right to crowd his own peculiar notions of theology upon all, whether they are acceptable or not. Yet there is common ground which he can occupy, and to which no reasonable man can object. He can teach a reverence for the Supreme Being, a reverence for his Holy Word, for the influences of his Spirit, for the character and teachings of the Saviour, and for the momentous concerns of eternity. He can teach the evil of sin in the sight of God, and the awful consequences of it upon the individual. He can teach the duty of repentance, and the privilege of forgiveness. He can teach our duty to worship God, to obey his laws, to seek the guidance of his Spirit, and the salvation by his Son. He can illustrate the blessedness of the divine life, the beauty of holiness, and the joyful hope of heaven;—and to all this no reasonable man will be found to object, so long as it is done in a truly Christian spirit.

If not in express words, most certainly his life and example should teach this. Man is a religious being. The religious principle should be early cultivated. It should be safely and carefully cultivated; and as this cultivation is too often entirely neglected by parents, unless it is attempted by the teacher in many cases it will never be effected at all.

Of course all those points which separate the community into sects, must be left to the family, the sabbath-school, and the pulpit. The teacher is responsible for his honesty in this matter. While he has no right to lord it over the private conscience of any one, he is inexcusable, if, believing the great truths of the Bible, he puts them away as if they concerned him not. They should command his faith, and govern his conduct; and their claims upon the young should not be disowned.

At any rate, the teacher should be careful that his teaching and his example do not prejudice the youthful mind against these truths. It is a hazardous thing for a man to be sceptical by himself, even when he locks his opinions up in the secrecy of his own bosom; how great, then, is the responsibility of teaching the young to look lightly upon the only book that holds out to us the faith of immortality, and opens to us the hope of heaven! Let the teacher well consider this matter, and take heed that his teaching shall never lead one child of earth away from his heavenly Father, or from the rest of the righteous in the home of the blest.

In view of what has been said, the young candidate for the teacher's office, almost in despair of success, may exclaim, "Who is sufficient for these things?" "Who can meet and sustain such responsibility?" Our answer is, the true inquirer after duty will not go astray. He is insufficient for these things, who is self-confident, who has not yet learned his own weakness, who has never found out his own faults, and who rushes to this great work, as the unheeding "horse rusheth into the battle," not knowing whither he goeth. Alas! how many there are who enter this profession without the exercise of a single thought of the responsibleness of the position, or of any of the great questions which must in their schools for the first time be presented for their decision! How many there are who never reflect upon the influence of their example before the young, and are scarcely conscious that their example is of any consequence! Such, in the highest sense, will fail of success. How can they be expected to go right, where there is only one right way, but a thousand wrong? Let such persons pause and consider, before they assume responsibilities which they can neither discharge nor evade. Let such ask with deep solicitude, "Who is sufficient for these things?"

But to the young person really desirous of improvement; to him who has taken the first and important step toward knowledge, by making the discovery that everything is not already known; to him who sees beforehand that there are real difficulties in this profession, and who is not too proud or self-conceited to feel the need of special preparation to meet them; to him who has some idea of the power of example in the educator, and who desires most of all things that his character shall be so pure as to render his example safe; to him who has discovered that there are some deep mysteries in human nature, and that they are only to be fathomed by careful study; to him who really feels that a great thing is to be done, and who has the sincere desire to prepare himself to do it aright; to him, in short, who has the *true spirit of the teacher*,—we may say, there is nothing to fear. An honest mind with the requisite industry, *is sufficient for these things.*

LESSONS IN ITALIAN GRAMMAR.—No. XLV.

Finire, to finish.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *finire*, to finish	Past: *avére finito*, to have finished
Present Gerund: *finéndo*, finishing	Past Gerund: *avendo finito*, having finished
Past Participle: *Finito*, finished	

INDICATIVE MOOD.

Present.	*finimmo* we finished
Finisco, I finish	*finíste*, you finished
finisci, thou finishest	*finírono*, they finished
finisce, he finishes	Future.
finiámo, we finish	*Finirò*, I shall or will finish
finíte, you finish	*finirài*, thou wilt finish
finiscono, they finish	*finirà*, he will finish
Imperfect.	*finirémo*, we will finish
Finiva, I was finishing	*finiréte*, you will finish
finivi, thou wast finishing	*finiránno*, they will finish
finiva, he was finishing	Conditional Present.
finivámo, we were finishing	*Finiréi*, I should or would finish
finivate, you were finishing	*finirésti*, thou wouldst finish
finivano, they were finishing	*finirébbe*, he would finish
Indeterminate Preterite.	*finirémmo*, we would finish
Finii, I finished	*finiréste*, you would finish
finísti, thou finishedst	*finirébbero*, they would finish
finì, he finished	

IMPERATIVE MOOD.

[No First Person.]	*finiámo*, let us finish
Finisci, finish (thou)	*finíte*, finish (ye or you)
finísca, let him finish	*finíscano*, let them finish

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che finísca, that I may finish	*Che finissi*, that I might finish
che finísca, that thou mayst finish	*che finissi*, that thou mightst finish
che finísca, that he may finish	*che finísse*, that he might finish
che finiámo, that we may finish	*che finissimo*, that we might finish
che finiáte, that you may finish	*che finíste*, that you might finish
che finíscano, that they may finish	*che finissero*, that they might finish

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So conjugate—

Abbellire, to embellish
Abbonire, to perfect
Abbronzire, to tan
Abbrostire, to roast
Abbrostolire, to toast
Abbruttire, to grow plain
Abolire, to abolish
Abortire, to miscarry
Accalorire, to heat
Accolorire, to colour
Accudire, to despatch
Acetire, to grow sour
Addolcire, to soften
Aderire, to adhere
Affievolire, to debilitate
Affortire, to fortify
Affralire, to weaken
Aggentilire, to adorn
Aggradire, to accept
Aggrandire, to enlarge
Aggnerrire, to train up in war.
Alleggerire, to appease
Allenire, to mitigate
Allestire, to prepare
Amarire, to imbitter
Ambire, to aspire
Ammannire, to prepare
Ammansire, to soften
Ammattire, to grow distracted
Ammollire, to open
Ammonire, to advise
Ammorbidire, to loosen
Ammortire, to cool
Ammutire, *Ammutolire*, } to become dumb
Anneghittire, to grow lazy
Annerire, to defame
Annichilire, to annihilate
Appassire, to wither
Appetire, to desire
Appiccinire, to lessen
Appigrire, to make lazy
Arricchire, to enrich
Arrossire, to blush
Arrostire, to roast
Arrozzire, to make harsh
Arrugginire, to grow rusty
Asserire, to assert
Assordire, to deafen
Assortire, to sort
Assoggettire, to subdue
Atterrire, to affright
Attribuire, to attribute
Attristire, to grieve
Attutire, to impose silence
Avvilire, to vilify
Avvizzire, to fade away
Bandire, to banish
Blandire, to flatter
Brandire, to brandish
Brunire, to burnish
Candire, to candy
Chiarire, to explain
Circuire, to encompass
Colorire, to dye
Colpire, to strike
Concepire, to conceive
Condire, to season
Conferire, to confer
Construire, to construct
Contribuire, to contribute
Contrire, to be contrite
Costituire, to constitute
Costruire, to construct
Custodire, to guard
Deferire, to defer
Difinire, to define
Demolire, to demolish
Differire, to differ
Diffinire, to define
Digerire, to digest
Dimasprire, to soften
Disseppellire, to unbury
Disfacerire, to cross
Disfinire, to explain
Disfornire, to unfurnish
Disghiottire, to vomit
Disgradire, to dislike
Disimpedire, to aid
Dispartire, to part
Disruvidire, to quicken
Distribuire, to distribute
Disubbidire, to disobey
Disvigorire, to lose strength
Disunire, to disunite
Erudire, to teach
Esaurire, to exhaust
Esibire, to exhibit
Esinanire, to destroy
Espedire, to send
Fallire, to fail
Fastidire, to vex
Favorire, to favour
Fiorire, to flourish
Fluire, to run
Fornire, to furnish
Garantire, to warrant
Gestire, to gesticulate
Ghermire, to seize
Gioire, to enjoy
Gradire, to accept
Grancire, to snatch
Granire, to seed
Gremire, to gripe
Grugnire, to growl
Guaire, to bark
Gualcire, to crush
Guarire, to cure
Guarnire, to garnish
Illaidire, to grow ugly
Illanguidire, to languish
Illiquidire, to liquefy
Imbaldanzire, to imbolden
Imboldire, to grow bold
Imbandire, to get dinner ready
Imbarberire, to grow barbarous
Imbarbogire, to grow childish
Imbastardire, to corrupt
Imbastire, to baste
Imbellire, to adorn
Imbetialire, to grow mad
Imbianchire, to wash
Imbiondire, to grow fair
Imbizzarrire, to fall into a passion
Imbolsire, to grow pursy
Imbonire, to appease
Imbottire, to quilt
Imbozzacchire, to grow wicked
Imbricconire, to grow knavish
Imbrunire, to grow dark
Imbrusehire, to grow sharp
Imbruttire, to grow ugly
Immagrire, to grow lean
Immalinconire, to be melancholy
Immalvagire, to become perverse
Immareire, to fret, to pine away
Impadronire, to seize
Impallidire, to grow pale
Impaurire, to terrify
Impazientire, to lose patience
Impedire, to hinder
Impervertire, to pervert
Impiccolire, to diminish
Impidocchire, to breed lice
Impigrire, to grow idle
Impoltronire, to grow lazy
Imporrire, to mould
Impostemire, to imposthumate
Impoverire, to impoverish
Improsperire, to be happy
Imputridire, to putrefy
Impuzzolire, to stink
Inacerbire, to grow violent
Inacetire, to become sour
Inacutire, to sharpen
Inalidire, to grow dry
Inanimire, to encourage
Inaridire, to wither
Inasinire, to be an ass
Inasprire, to exasperate
Inavarire, to grow a miser
Incagnire, to turn mad
Incallire, to grow hard
Incalvire, to grow bald
Incancherire, to fester
Incanutire, to grow gray
Incaparbire, to be obstinate
Incapocchire, to become stupid
Incaponire, to persist
Incapriccire, to fall in love
Incatarrire, to catch cold
Incatorzolire, to wither away
Incattivire, to grow wicked
Incenerire, to burn to ashes
Inceroonire, to grow sour
Incipriguire, to exasperate
Incivilire, to grow civil
Incollerire, to be angry
Incrudelire, to exasperate
Incrudire, to make harsh
Indebolire, to grow weak
Indolcire, to sweeten
Indolentire, to grow stupid
Indolenzire, to grow numb
Indrudire, to grow amorous
Infarcire, to stuff
Infastidire, to trouble
Infellonire, to grow cruel
Infemminire, to be effeminate
Inferire, to infer
Infierocire, to become cruel
Infervorire, to animate
Infiacchire, to become weak
Infievolire, to weaken
Infingardire, to grow idle
Infollire, to become a fool
Infortire, to strengthen
Infracidire, to putrefy
Infralire, to grow weak
Infrigidire, to cool
Ingagliardire, to grow brisk
Ingelosire, to grow jealous
Ingentilire, to ennoble
Ingerire, to intermeddle
Ingiallire, to grow yellow
Ingiovanire, to grow young
Ingrandire, to increase
Innacerbire, to grow acid
Innagrestire, to grow sour
Innanimire, to animate
Innaridire, to grow dry
Innasprire, to make hard
Innuzzolire, to excite a desire
Inorgoglire, to make proud
Inorridire, to shake for fear
Inquisire, to accuse
Irretire, to ensnare
Irrigidire, to become severe
Irrugginire, to rust
Insalvatichire, to grow wild
Insanire, to grow mad
Inschiavire, to enslave
Inserire, to insert
Insignire, to adorn
Insignorire, to make one master
Insipidire, to become insipid
Insolentire, to grow saucy
Insollire, to rise up in arms
Insordire, to become deaf
Insospettire, to suspect
Insozzire, to stain
Insterilire, to grow barren
Instituire, to institute
Instruire, to instruct
Instupidire, to be surprised
Insuperbire, to grow proud
Intenebrire, to darken
Intenerire, to mollify
Intiepidire, to cool
Intignosire, to become scurvy
Intimidire, to frighten
Intimorire, to terrify
Intirizzire, to stiffen
Intisichire, to grow consumptive
Intorbidire, to disturb
Intormentire, to benumb
Intorpidire, to grow stupid
Intristire, to become wicked
Invaghire, to fall in love
Invanire, to grow proud
Invelre, to censure
Invelenire, to irritate
Inverminire, to breed worms
Invigorire, to strengthen
Invilire, to discourage
Invincidire, to grow soft
Inviperire, to rage
Invischidire, to become glutinous
Invizzire, to decay
Inumidire, to moisten
Involpire, to grow cunning
Invuzzolire, to desire
Inzotichire, to grow awkward
Irricchire, to become rich
Irritrosire, to grow peevish
Istituire, to institute
Istruire, to instruct
Largire, to give
Lenire, to soften
Obbedire, to obey
Olire, to smell
Ostruire, to obstruct
Partorire, to produce
Patire, to suffer
Pattuire, to agree
Piatire, to contend
Polire, to polish
Poltrire, to be idle
Preferire, to prefer
Presagire, to foretell
Preterire, to leave
Proferire, to utter
Progredire, to advance
Proibire, to prohibit
Rabbellire, to adorn
Rabbonire, to appease
Raddolcire, to sweeten
Raggentilire, to embellish
Rammollire, to soften
Rammorbidire, to temperate
Rapire, to ravish
Rattiepidire, to cool

Ravvilire, to discourage.
Ravvincidire, to grow soft
Redarguire, to rebuke
Referire, to report
Restituire, to restore
Reverire, to revere
Riabbellire, to embellish
Riagire, to act anew
Riarricchire, to enrich again
Ribadire, to rivet
Ribandire, to call from exile
Richiarire, to become clear
Ricolorire, to colour anew
Riconcepire, to conceive again
Ricondire, to season again
Ricostituire, to replace
Riferire, to refer
Rifiorire, to flourish again
Rinfronzire, to repair
Ringentilire, to ennoble
Ringioire, to rejoice
Ringiovanire, to grow young
Ringiovialire, to become joyful
Ringrandire, to increase
Rinsavire, to grow wise again
Rinserenire, to become clear
Rinsignorire, to be master again
Rintenerire, to soften
Rintiepidire, to cool
Rinverzire, to grow green again
Rinvigorire, to restore
Rinvilire, to lower
Ripartorire, to lie in again
Ripulire, to clean
Risarcire, to repair
Risbaldire, to make merry
Risteccbire, to grow dry
Ristituire, to restore
Ritribuire, to requite
Ritrosire, to grow peevish
Riunire, to re-unite
Sbaldanzire, to despond
Sbalordire, to astonish
Sbandire, to banish
Sbigottire, to despond
Sbizzarrire, to grow complaisant
Scalfire, to scarify
Scarnire, to diminish
Scaturire, to flow
Schermire, to fence
Schernire, to mock
Schiarire, to shine upon
Schiattire, to bark
Schiencire, to shun
Sciapidire, to become insipid
Scipidire, to grow insipid
Scipire, to grow insipid
Scolorire, to fade
Semenzire, to run to seed
Seppellire, to bury
Sfavorire, to contradict
Sfornire, to unfurnish
Sgarire, to be the uppermost
Sghermire, to get loose
Sgomentire, to dishearten
Sgradire, to displease
Smaltire, to digest
Smarrire, to lose
Sminuire, to diminish
Smunire, to re-instate
Sopire, to suppress
Sostituire, to substitute
Spaurire, to terrify
Spervertire, to pervert
Spessire, to thicken
Stabilire, to establish
Starnutire, to sneeze
Statuire, to deliberate
Stecchire, to become dry
Sterilire, to make barren
Stizzire, to make angry
Stordire, to stun
Stormire, to make a noise
Stramortire, to faint
Stremenzire, to weaken
Stupidire, to wonder
Stupire, to amaze
Svanire, to vanish
Svelenire, to mitigate
Svilire, to disgrace
Supplire, to supply
Tradire, to betray
Traferire, to wound
Tramortire, to faint away
Trasferire, to transfer
Trasgredire, to transgress
Trasricchire, to make very rich
Vagire, to cry
Ubbidire, to obey
Usucapire, to enjoy by prescription

Cucire, to sew.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *cucire*, to sew	Past: *avére cucito*, to have sewed
Present Gerund: *cucéndo*, sewing	Past Gerund: *avéndo cucito*, having sewed
Past Participle: *cucito*, sewed	

INDICATIVE MOOD.

Present.

Cúcio, I sew
cúci, thou sewest
cúce, he sews
cuciámo, we sew
cucite, you sew
cúciono, they sew

Imperfect.

Cucéva, or *cucía*, I was sewing
cucívi, thou wast sewing
cucéva or *cucía*, he was sewing
cucivámo, we were sewing
cucivéte, you were sewing
cucívano or *cucíano*, they were sewing

Indeterminate Preterite.

Cucíi, I sewed
cuciásti, thou sewedst
cucì, he sewed
cucímmo, we sewed
cuciste, you sewed
cucírono, *cucéro*, *cucír*, they sewed

Future.

Cucirò, I shall or will sew
cucirài, thou wilt sew
cucirà, he will sew
cucirémo, we will sew
cuciréte, you will sew
cuciránno, they will sew

Conditional Present.

cucirèi or *cuciría*, I should or would sew
cucirésti, thou wouldst sew
cucirébbe or *cuciría*, he would sew
cucirémmo, we would sew
cuciréste, you would sew
cucirébbero or *cucirían*, they would sew

IMPERATIVE MOOD.

[No First Person.]
Cúci, sew (thou)
cúcia, let him sew
cuciámo, let us sew
cucite, sew (ye or you)
cúciano, let them sew

SUBJUNCTIVE MOOD.

Present.	Imperfect.
che cúcia, that I may sew	*che cucíssi*, that I might sew
che cúcia, that thou mayst sew	*che cucíssi*, that thou mightst sew
che cúcia, that he may sew	*che cucísse*, that he might sew
che cuciámo, that we may sew	*che cucíssimo*, that we might sew
che cuciate, that you may sew	*che cucíste*, that you might sew
che cúciano, that they may sew	*che cucíssero*, that they might sew

Aprire, to open.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *aprire*, to open	Past: *avére apérto*, to have opened
Present Gerund: *aprèndo*, opening	Past Gerund: *avéndo apérto*, having opened
Past Participle: *apérto*, opened	

INDICATIVE MOOD.

Present.

A pro, I open
apri, thou openest
apre, he opens
apriámo, we open
aprite, you open
aprano, they open

Imperfect.

Apriva or *apría*, I was opening
aprivi, thou wast opening
apriva or *apría*, he was opening
aprivámo, we were opening
aprivate, you were opening
aprívano or *apríano*, they were opening

Indeterminate Preterite.

Aprii or *apérsi*, I opened
apristi, thou openedst
apri, *apérse*, or *aprío*, he opened
aprimmo, we opened
aprìste, you opened
aprirono or *apérsero*, they opened

Future.

Aprirò, I shall or will open
aprirài, thou wilt open
aprirà, he will open
aprirémo, we will open
aprirete, you will open
apriránno, they will open

Conditional Present.

Apriréi or *apriría*, I should or would open
apriresti, thou wouldst open
aprirébbe or *apriría*, he would open
apriremmo, we would open
apriréste, you would open
aprirébbero or *apririano*, they would open

IMPERATIVE MOOD.

[No First Person.]
Apri, open (thou)
apra, let him open
apriámo, let us open
aprite, open (ye or you)
aprano, let them open

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Subjunctive Mood.

Present.	Imperfect.
Che dpra, that I may open	*Che aprissi*, that I might open
che apra, that thou mayst open	*che aprissi*, that thou mightst open
che dpra, that he may open	*che aprisse*, that he might open
che apriámo, that wa may open	*che aprissimo*, that wa might open
che apridte, that you may open	*che aprinte*, that you might open
che dprano, that they may open	*che aprissero*, that they might open

Dire, to say.

Infinitive Mood.

Simple Tenses.	*Compound Tenses*
Present: *dire*, to say	Past: *avére détto*, to have said
Present Gerund: *dicéndo*, saying	Past Gerund: *avéndo détto*, having said
Past Participle: *détto*, said	

Indicative Mood.

Present.	*disse*, he said
Dico, I say	*dicémmo*, we said
dici or *di'*, thou sayest	*dicéste*, you said
dice, he says	*dissero*, they said
diciámo, we say	Future.
dite, you say	*Dirò*, I shall or will say
dicono, they say	*dirai*, thou wilt say
Imperfect.	*dirà*, he will say
Dicéva or *diceá*, I was saying	*diremo*, wa will say
dicévi, thou wast saying	*diréte*, you will say
dicéva or *diceá*, he was saying	*diranno*, they will say
dicevámo, we were saying	Conditional Present.
dicevite, you were saying	*Direi*, I should or would say
dicévano, *diciano*, or *dicien*, they were saying	*diresti*, thou wouldst say
Indeterminate Preterite.	*direbbe*, he would say
Dissi, I said	*diremmo*, we would say
dicesti, thou saidst	*direste*, you would say
	direbbero, they would say

Imperative Mood.

[No First Person.]	*dicidmo*, let us say
Di, say (thou)	*dite*, say (ya or you)
dica, let him say	*dicano*, let them say

Subjunctive Mood.

Present.	Imperfect.
Che dica, that I may say	*Che dicéssi*, that I might say
che dica, that thou mayest say	*che dicéssi*, that thou mightst say
che dica, that he may say	*che dicésse*, that he might say
che diciámo, that we may say	*che dicéssimo*, that we might say
che diciate, that you may say	*che diciste*, that you might say
che dicano, that they may say	*che dicéssero*, that they might say

So conjugate—

Benedire, to bless	*Predire*, to foretell
Contradire, to contradict	*Ridire*, to speak again
Interdire, to forbid	*Sopraabenedire*, to bless again
Maledire, to curse	*Sopraddire*, to add something

LESSONS IN SPANISH.—No. XV.

Conjugation.—*Continued.*

Poner, to place, to put.

Past Participle: *puesta*. | Gerund: *poniendo*.

Indicative Mood.

Present.

Pongo, | [No other Persons Irregular.]

Perfect Definite.

Puse,	*Pusimos*,
Pusiste,	*Pusisteis*,
Puso,	*Pusieron*,

First Future.

Pondré,	*Pondremos*,
Pondrás,	*Pondréis*,
Pondrá,	*Poedrán*,

Imperative Mood.

Ponga,	*Pongamos*,
Pon,	
Ponga,	*Pongan*,

Subjunctive Mood.

Present.

Ponga,	*Pongamos*
Pongas,	*Pongais*,
Ponga,	*Pongan*,

Imperfect.

Pusiera, pondria, pusiese,	*Pusiéramos, pondriamos, pusiésemos*,
Pusieras, pondrias, pusieses,	*Pusiérais, pondriais, pusiéscis*,
Pusiera, pondria, pusiese,	*Pusieron, pondrien, pusiesen*,

First Future.

Pusiere,	*Pusiéremos*,
Pusieres,	*Pusiéreis*,
Pusiere,	*Pusieren*,

Querer, to be willing, to wish.

Past Participle: *querido*. | Gerund: *queriendo*.

Indicative Mood.

Present.

Quiero,	
Quieres,	
Quiere,	*Quieren*,

Perfect Definite.

Quise,	*Quisimos*,
Quisiste,	*Quisisteis*,
Quiso,	*Quisieron*,

First Future.

Querré,	*Querremos*,
Querrás,	*Querréis*,
Querrá,	*Querrán*,

Imperative Mood.

Quiera,	
Quiere,	
Quiera,	*Quieran*,

Subjunctive Mood.

Present.

Quiera,	
Quieras,	
Quiera,	*Quieran*,

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Imperfect.

Quisiera, querría, quisiese,	*Quisiéramos, querríamos, quisiésemos,*
Quisieras, querrías, quisieses,	*Quisiérais, querríais, quisieseis,*
Quisiera, querría, quisiese,	*Quisieran, querrían, quisiesen,*

First Future.

Quisiere,	*Quisiéremos,*
Quisieres,	*Quisiereis,*
Quisiere,	*Quisieren,*

Saber, to know.

Past Participle: *sabido.* | Gerund: *sabiendo.*

Indicative Mood.

Present.

Sé, | [No other Persons Irregular.]

Perfect Definite.

Supe,	*Supimos,*
Supiste,	*Supisteis,*
Supo,	*Supieron,*

First Future.

Sabré,	*Sabremos,*
Sabrás,	*Sabréis,*
Sabrá,	*Sabrán,*

Imperative Mood.

Sepa,	*Sepamos,*
Sepa,	*Sepan,*

Subjunctive Mood.

Present.

Sepa,	*Sepamos,*
Sepas,	*Sepais,*
Sepa,	*Sepan,*

Imperfect.

Supiera, sabría, supiese,	*Supiéramos, sabríamos, supiésemos,*
Supieras, sabrías, supieses,	*Supiérais, sabríais, supieseis,*
Supiera, sabría, supiese,	*Supieran, sabrían, supiesen,*

First Future.

Supiere,	*Supiéremos,*
Supieres,	*Supiereis,*
Supiere,	*Supieren,*

Tender, to tend, to extend.

Past Participle: *tendido.* | Gerund: *tendiendo.*

Indicative Mood.

Present.

Tiendo,	
Tiendis,	
Tiende,	*Tienden,*

Imperative Mood.

Tienda,	
Tiende,	
Tienda,	*Tiendan,*

Subjunctive Mood.

Present.

Tienda,	
Tiendas,	
Tienda,	*Tiendan,*

Traer, to bring, to carry.

Past Participle: *traido.* | Gerund: *trayendo.*

Indicative Mood.

Present.

Traigo, | [No other Persons Irregular.]

Perfect Definite.

Traje,	*Trajimos,*
Trajiste,	*Trajisteis,*
Trajo,	*Trajeron,*

Imperative Mood.

Traiga,	*Traigamos,*
Traiga,	*Traigan,*

Subjunctive Mood.

Present.

Traiga,	*Traigamos,*
Traigas,	*Traigáis,*
Traiga,	*Traigan,*

Imperfect.

Trajera, trajese,	*Trajéramos, trajésemos,*
Trajeras, trajeses,	*Trajérais, trajeseis,*
Trajera, trajese,	*Trajeran, trajesen,*

First Future.

Trajere,	*Trajéremos,*
Trajeres,	*Trajereis,*
Trajere,	*Trajeren,*

Valer, to be worth.

Past Participle: *valido.* | Gerund: *valiendo.*

Indicative Mood.

Present.

Valgo, | [No other Persons Irregular.]

First Future.

Valdré,	*Valdremos,*
Valdrás,	*Valdreis,*
Valdrá,	*Valdrán,*

Imperative Mood.

Valga,	*Valgamos,*
Valga,	*Valgan,*

Subjunctive Mood.

Present.

Valga,	*Valgamos,*
Valgas,	*Valgáis,*
Valga,	*Valgan,*

Imperfect.

Valdría,	*Valdríamos,*
Valdrías,	*Valdríais,*
Valdría,	*Valdrían,*

Ver, to see.

Past Participle: *visto.* | Gerund: *viendo.*

Indicative Mood.

Present.

Veo, | [No other Persons Irregular.]

Imperfect.

Veia,	*Veiamos,*
Veias,	*Veiais,*
Veia,	*Veian,*

Imperative Mood.

Vea,	*Veamos,*
Ven,	*Vean,*

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SUBJUNCTIVE MOOD.

Present.

Vea,	*Veamos,*
Veas,	*Veáis,*
Vea,	*Vean,*

3rd Conjugation.

Adquirir, to acquire.

Past Participle: *adquirido.* | Gerund: *adquiriendo.*

INDICATIVE MOOD.

Present.

Adquiero,	
Adquieres	
Adquiere,	*Adquieren,*

IMPERATIVE MOOD.

Adquiera,	
Adquiere,	
Adquiera,	*Adquieran,*

SUBJUNCTIVE MOOD.

Present.

Adquiera,	
Adquieras,	
Adquiera,	*Adquieran,*

Asir, to seize.

Past Participle: *asido.* | Gerund: *asiendo.*

INDICATIVE MOOD.

Present.

Asgo,	[No other Persons Irregular.]

IMPERATIVE MOOD.

Asga,	*Asgamos,*
Asga,	*Asgan,*

SUBJUNCTIVE MOOD.

Present.

Asga,	*Asgamos,*
Asgas,	*Asgáis,*
Asga,	*Asgan,*

This verb is but little used in those persons of tenses that are irregular.

Bendecir, to bless.

Past Participle: *bendecido.* | Gerund: *bendeciendo.*

INDICATIVE MOOD.

Present.

Bendigo,	
Bendices,	
Bendice	*Bendicen,*

Perfect Definite.

Bendije,	*Bendijimos,*
Bendijiste,	*Bendijisteis,*
Bendijo,	*Bendijeron,*

IMPERATIVE MOOD.

Bendiga,	*Bendigamos,*
Bendice,	
Bendiga,	*Bendigan,*

SUBJUNCTIVE MOOD.

Present.

Bendiga,	*Bendigamos,*
Bendigas,	*Bendigáis,*
Bendiga,	*Bendigan,*

Imperfect.

Bendijera, bendijese,	*Bendijéramos, bendijésemos,*
Bendijeras, bendijeses,	*Bendijérais, bendijéseis,*
Bendijera, bendijese,	*Bendijeran, bendijesen,*

First Future.

Bendijere,	*Bendijéremos*
Bendijeres,	*Bendijéréis,*
Bendijere,	*Bendijeren,*

Maldecir, to curse, is irregular in the same persons and tenses as *bendecir.*

Decir, to say.

Past Participle: *dicho.* | Gerund: *diciendo,*

INDICATIVE MOOD.

Present.

Digo,	
Dices,	
Dice,	*Dicen,*

Perfect Definite.

Dije,	*Dijimos,*
Dijiste,	*Dijisteis,*
Dijo,	*Dijeron,*

First Future.

Diré,	*Diremos,*
Dirás,	*Diréis,*
Dirá,	*Dirán,*

IMPERATIVE MOOD.

Diga,	*Digamos,*
Di,	
Diga,	*Digan,*

SUBJUNCTIVE MOOD.

Present.

Diga,	*Digamos,*
Digas,	*Digáis,*
Diga,	*Digan,*

Imperfect.

Dijera, dirla, dijese,	*Dijéramos, dirlamos, dijésemos,*
Dijeras, dirlas, dijeses,	*Dijérais, dirlais, dijéseis,*
Dijera, dirla, dijese,	*Dijeran, dirlan, dijesen*

First Future.

Dijere,	*Dijéremos,*
Dijeres,	*Dijéreis,*
Dijere,	*Dijeren,*

Contradecir, desdecir, and *predecir,* end their second person singular of the imperative in *ice;* as, *contradice, desdice, predice.* In other respects they are conjugated like *decir.*

Dormir, to sleep.

Past Participle: *dormido.* | Gerund: *durmiendo.*

INDICATIVE MOOD.

Present.

Duermo,	
Duermes,	
Duerme,	*Duermen,*

Perfect Definite.

Durmió,	*Durmiéron,*

IMPERATIVE MOOD.

Duerma,	*Durmamos,*
Duerme,	
Duerma,	*Duerman,*

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Subjunctive Mood.

Present.

Duerma,	*Durmamos,*
Duermas,	*Durmáis,*
Duerma,	*Duerman,*

Imperfect.

Durmiera, durmiese,	*Durmiéramos, durmiésemos,*
Durmieras, durmieses,	*Durmiérais, durmiéseis,*
Durmiera, durmiese,	*Durmieran, durmiesen,*

First Future.

Durmiere,	*Durmiéremos,*
Durmieres,	*Durmiéreis,*
Durmiere,	*Durmieren,*

Erguir, to stand erect.

Past Participle: *erguido.* | Gerund: *irguiendo.*

Indicative Mood.

Present.

Hiergo or *yergo,*	
Hirgues,	
Hiergue,	*Hierguen,*

Perfect Definite.

Irguió	*Irguieron,*

Imperative Mood.

Hiergu or *yergu,*	*Irgamos,*
Hiergue,	
Hierga,	*Hiergan,*

Subjunctive Mood.

Present.

Hiergu or *yerga,*	*Irgamos,*
Hiergas,	*Irgais,*
Hierga,	*Hiergan,*

Imperfect.

Irguiera, irguiese,	*Irguiéramos, irguiésemos,*
Irguieras, irguieses,	*Irguiérais, irguieseis,*
Irguiera, irguiese,	*Irguieran, irguiesen,*

First Future.

Irguiere,	*Irguiéremos,*
Irguieres,	*Irguiereis,*
Irguiere,	*Irguieren,*

Incluir, to include.

Past Participle: *incluido.* | Gerund: *incluyendo.*

Indicative Mood.

Present.

Incluyo,	
Incluyes,	
Incluye,	*Incluyen,*

Imperative Mood.

Incluya,	*Incluyamos,*
Incluye,	
Incluya,	*Incluyan,*

Subjunctive Mood.

Present.

Incluya,	*Incluyamos,*
Incluyas,	*Incluyáis,*
Incluya.	*Incluyan,*

Imperfect.

Incluyera, incluyese,	*Incluyéramos, incluyésemos,*
Incluyeras, incluyeses,	*Incluyérais, incluyeseis,*
Incluyera, incluyese,	*Incluyeran, incluyesen,*

First Future.

Incluyere,	*Incluyéremos,*
Incluyeres,	*Incluyéreis,*
Incluyere,	*Incluyeren,*

Ir, to go.

Past Participle: *ido.* | Gerund: *yendo.*

Indicative Mood.

Present.

Voy,	*Vamos,*
Vas,	*Vais,*
Va,	*Van,*

Imperfect.

Iba,	*Íbamos,*
Ibas,	*Íbais,*
Iba,	*Iban,*

Perfect Definite.

Fui,	*Fuimos,*
Fuiste,	*Fuisteis,*
Fué,	*Fueron,*

Imperative Mood.

Vuya,	*Vamos,**
Ve,	*Id,*
Vaya,	*Vayan,*

Subjunctive Mood.

Present.

Vuyu,	*Vayamos,*
Vayas,	*Vayais,*
Vaya,	*Vayan,*

Imperfect.

Fuera, fuese,	*Fuéramos, fuésemos,*
Fueras, fueses,	*Fuérais, fueseis,*
Fuera, fuese,	*Fueran, fuesen,*

First Future.

Fuere,	*Fuéremos,*
Fueres,	*Fuéreis,*
Fuere,	*Fueren,*

Lucir, to shine.

Past Participle: *lucido.* | Gerund: *luciendo.*

Indicative Mood.

Present.

Luzco,	[No other Persons Irregular.]

Imperative Mood.

Luzca,	*Luzcamos.*
Luzca,	*Luzcan,*

Subjunctive Mood.

Present.

Luzca,	*Luzcamos,*
Luzcas,	*Luzcais,*
Luzca,	*Luzcan,*

* Sometimes *vayamos* though this form is now seldom used.

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LESSONS IN READING AND ELOCUTION.

No. XXVI.

OUR CONTROL OVER OUR PHYSICAL WELL-BEING.

It is a truth fitted to awaken our most fervent gratitude to the Author of our existence, that he has placed the great conditions of our physical well-being under our own control. Of the nature or essence of the vital principle we are as yet ignorant. Some of the internal ganglia, also, are mysteries to the profoundest science. Of the more subtile movements in the interior of the system we can take no available cognizance. These inward vital processes are not subject to our volition. The heart will not continue to beat nor the blood to flow at the bidding of the mightiest of the earth.

The sculpture-like outline of the body; its gradual and symmetrical expansion from infancy to manhood,—every day another, yet the same; the carving and grooving of all the bones and joints; the weaving of the muscles into a compact and elastic fabric, and their self-lubricating power, by which, though pressed together in the closest order, and crossing each other in all directions, they yet play their respective parts, without perceptible friction; the winding up of the heart, so that it will vibrate the seconds of threescore years and ten, without repair or alteration; the channelling out of the blood-vessels, more numerous than all the rivers of a continent, and so thoroughly permeating every part, that there is no desert or waste spot left, where their fertilising currents do not flow; the triple layer of the skin, with its infinite reticulation; the culling, and exact depositing, of the material of that most divinely-wrought organ, the brain, for whose exquisite workmanship it would seem as though air, and light, and heat, and electricity, had all been sifted and winnowed, and their finest particles selected for its composition; the diffusion of the nerves over every part of the frame, along whose darksome and attenuated threads the messengers of the mind pass to and fro with the rapidity of lightning; the fashioning of the vocal apparatus, so simple in its mechanism, and yet so varied in its articulation, and its musical range and compass; the hollowing out of the ear, which secures to us all the utilities and blessings of social intercourse; the opening of the eye, on whose narrow retina all the breadth and magnificence of the universe can be depicted; and, finally, the power of converting the coarse, crude, dead materials of our food, into sentient tissues, and miraculously enduing them with the properties of life;—over all these, as well as over various other processes of formation and growth, our will has no direct control. They will not be fashioned, or cease to be fashioned, at our bidding. It was in this sense that the question was put, "Which of you by taking thought can add one cubit unto his stature?" It is not by "taking thought," but by using the prescribed means,—by learning and obeying the physical laws,—that the stature can be made loftier, the muscles more vigorous, the senses quicker, the life longer, and the capacity of usefulness almost indefinitely greater.

It is diet, oxygenation of the blood, and personal purity or cleanliness, which have the prerogative of accomplishing these objects; and these are in our power, within our legitimate jurisdiction; and if we perform our part of the work, faithfully and fully, in regard to these things, Nature will perform her part of the work, faithfully and fully, in regard to those subtler and nicer operations which lie beyond our immediate control.—*Horace Mann.*

CLASSICAL LEARNING.

The importance of classical learning to professional education is so obvious, that the surprise is, that it could ever have become matter of disputation. I speak not of its power in refining the taste, in disciplining the judgment, in invigorating the understanding, or in warming the heart with elevated sentiments; but of its power of direct, positive, necessary instruction. Until the eighteenth century, the mass of science, in its principal branches, was deposited in the dead languages, and much of it still reposes there. To be ignorant of these languages, is to shut out the lights of former times, or to examine them only through the glimmerings of inadequate translations.

It is often said, that there have been eminent men and eminent writers to whom the ancient languages were unknown,—men who have risen by the force of their talents, and writers who have written with a purity and ease which hold them up as models for imitation. On the other hand, it is as often said, that scholars do not always compose either with elegance or chasteness; that their diction is sometimes loose and harsh, and sometimes ponderous and affected.

Be it so. I am not disposed to call in question the accuracy of either statement. But I would, nevertheless, say that the presence of classical learning was not the cause of the faults of one class, nor the absence of it the cause of the excellence of the other. And I would put this fact, as an answer to all such reasonings, that there is not a single language of modern Europe, in which literature has made any considerable advances, which is not directly of Roman origin, or has not incorporated into its very structure many, very many, of the idioms and peculiarities of the ancient tongues. The English language affords a strong illustration of the truth of this remark. It abounds with words and meanings drawn from classical sources. Innumerable phrases retain the symmetry of their ancient dress. Innumerable expressions have received their vivid tints from the beautiful dyes of Roman and Grecian roots. If scholars, therefore, do not write our language with ease, or purity, or elegance, the cause must lie somewhat deeper than a conjectural ignorance of its true diction.

I repeat, there is not a single nation, from the north to the south of Europe, from the bleak shores of the Baltic to the bright plains of immortal Italy, whose literature is not imbedded in the very elements of classical learning. The literature of England is, in an emphatic sense, the production of her scholars,—of men who have cultivated letters in her universities, and colleges, and grammar-schools,—of men who thought any life too short, chiefly because it left some relic of antiquity unmastered, and any other fame humble, because it faded in the presence of Roman and Grecian genius. He who studies English literature without the lights of classical learning, loses half the charms of its sentiments and style, of its force and feelings, of its delicate touches, of its delightful allusions, of its illustrative associations. Who that reads the poetry of Gray, does not feel that it is the refinement of classical taste which gives such inexpressible vividness and transparency to its diction? Who that reads the concentrated sense and melodious versification of Dryden and Pope, does not perceive in them the disciples of the old school, whose genius was inflamed by the heroic verse, the terse satire, and the playful wit of antiquity? Who that meditates over the strains of Milton, does not feel that he drank deep at

> —— "Siloa's brook that flowed
> Fast by the oracle of God?"

that the fires of his magnificent mind were lighted by coals from ancient altars?

It is no exaggeration to declare, that he who proposes to abolish classical studies, proposes to render, in a great measure, inert and unedifying the mass of English literature for three centuries; to rob us of much of the glory of the past, and much of the instruction of future ages; to blind us to excellences which few may hope to equal, and none to surpass; to annihilate associations which are interwoven with our best sentiments, and give to distant times and countries a presence and reality, as if they were, in fact, our own.—*Joseph Story.*

DARK NATURE'S CHARMS.

I love to pause, in life's cold rugged way,
And muse on Nature in her various forms;
Divest her of that seeming dark array,
And thus expose to view her fairest charms:
For she is ever beautiful and bright,
When rightly seen, in wild or calmer mood,
In sunny day or sable garb of night,
In busy haunts, or quiet solitude.

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Oh! my delight has ever been to roam,—
A feather, tossed on fortune's fickle wave—
Away from friends, from kindred, and from home
The cold repulses of the world to brave.
And when by life's attending ills oppressed,
Dear Nature, I would ever turn to thee,
For in thy smiles the troubled find a rest,
A soothing cordial in thy harmony.

I've danced upon the trackless ocean wave,
When wild winds held unfettered revelry,
And heaven's loud peals the thundering chorus gave
To the rude tempest's dirge-like minstrelsy.
Then wings the soul its airy flight along,
Like lightning glancing o'er the jewelled spray,
And leaps to join the revel and the song,
And cast the thoughts and things of earth away.

And I have wooed her in her sober hours,
Amid her native wilds of solitude,
When twilight has revealed its mystic powers,
And cast its spells o'er river, vale, and wood;
'Tis *this* resolves the passions into thought,
And tinges reason with a purer flame,
And shows proud man that all his art is nought,
His boasted honours but an empty name.

The sunny south, the clime of fruits and flowers,
In one eternal vesture of sweet smiles,
Where laughing streamlets leap 'midst shady bowers,
And wild birds' song the sportive breeze beguiles;
And the bare mountains of the north, where storms
And the rude storm-king hold a fearful sway,
Have all their fierce or soul subduing charms,
To cheer life's path and drive its cares away.

Man often clouds with vain or fancied ills
His narrow span, when Nature's stainless light
Dispenses only happiness, and fills
The world with things so beautiful and bright;
Her plains, her mountains, and her valleys teem
With living verdure in the fairest dress;
And ocean, river, lake, and singing stream,
Combine to harmonize her loveliness.

Wm. C. Lodge.

CHRONOLOGY.—No. IX.

A.D.
1497.—South America discovered by Americus Vespucius.
1509.—Henry VIII., King of England.
1517.—Protestant Reformation begins.
1520.—Title of "Defender of the Faith" bestowed on Henry VIII. by the Pope.
1534.—The Reformation in England.
1537.—Monastic establishments suppressed in England.
1545.—The Council of Trent began.
1547.—Edward VI., King of England.
1549.—Lord Lieutenants of Counties first instituted in England.
1553.—Lady Jane Grey proclaimed Queen of England, but resigns the crown to Mary, daughter of Henry VIII. and Catherine of Arragon.
1555.—Religious persecution throughout England.
1558.—Elizabeth, Queen of England.
1572.—Protestants massacred in Paris on St. Bartholomew's Eve.
1579.—Rise of the Dutch Republic.
1580.—Sir Francis Drake completes his voyage round the world.
1582.—Amendment of the Calendar — the introduction of the Gregorian Style.
1587.—Mary Queen of Scots beheaded.
1588.—England threatened by Spain; total destruction of the Spanish Armada. Edict of Nantes passed.
1591.—Trinity College, Dublin, founded.
1603.—James VI. of Scotland, on the death of Queen Elizabeth, becomes King of England.
1605.—Gunpowder Plot.
1610.—Henry IV. of France murdered.
1614.—New River brought to London. First settlement in Virginia.
1621.—The Puritans established settlements in America.
1625.—Charles I., King of England.
A.D.
1632.—Gustavus Adolphus killed at the battle of Lutzen.
1640.—The Scots in arms against the King, on account of religious grievances. Massacre of Protestants in Ireland.
1642.—The struggle between the King and the Commons begins.
1649.—King Charles put to death.
1649—1660.—Commonwealth in England.
1660.—Restoration of Charles II.
1665.—The Great Plague of London.
1666.—London destroyed by fire.
1668.—The Peace of Aix-la-Chapella.
1678.—Habeas Corpus Act passed.
1685.—James II., King of England. Rebellion of the Duke of Monmouth. Edict of Nantes revoked.
1688.—James II. driven into exile. William III., Prince of Orange, King of England.
1689.—Scots, fighting for the exiled king, defeated at Killikrankie. Toleration Act passed. Land Tax established.
1690.—Battle of the Boyne.
1691.—Surrender of Limerick, which ended the war in Ireland between the followers of William of Orange and King James.
1693.—Bank of England established. Lotteries first introduced. Massacre of Glencoe.
1696.—Peace of Ryswick.
1698.—Woollen manufactures established in Ireland.
1700.—James II., exiled King of England, dies.
1701.—Prussia, formerly a dukedom, erected into a kingdom.
1702.—Anne, Queen of England.
1704.—Admiral Rooke takes Gibraltar from the Spaniards. Battle of Blenheim.
1706.—Battle of Ramillies.
1707.—Union of England and Scotland.

ANSWERS TO CORRESPONDENTS.

HOPEFUL.—We know of no good book on the art of book-binding.

A STUDENT should procure "Cassell's English-French and French-English Dictionary," complete for 7s. 6d.

F. C. SANDOWN.—The sun round which our earth revolves is not at rest. That it revolves on its axis is known; that it, with its attendant planets, revolves around another sun, is philosophically surmised.

HENRY JAMES.—It is usual both to register and to christen in the same names. If there be any difference, you are at liberty to use both or either. A husband is chargeable with the debts of his wife contracted before marriage.

TAU.—The objection to Euclid's twelfth axiom is, that, though it follows evidently enough from the twenty-eighth proposition, it is not self-evident, as an axiom ought to be, to one who has not read up to that proposition. To find in what propositions the definition and axiom respecting parallel straight lines are employed, it is only necessary to look at the references in the propositions. They are particularly used in Props. XXVII.—XXXI. of the First Book. To work the example respecting consols, add the ⅛s. 6d. per cent. commission to the price, which will then be 95⅛. The question then comes to this: if £95⅛ will purchase £100 of the stock, how much stock will £3,400 purchase? This may be found by proportion thus—

£95⅛ : £3,400 : : £100 : £3,574 4s. 10½½d. Ans.

G. M. Y.—We scarcely know how to make the explanation with regard to commission clearer than it already is. For every £100 which the agent collects in behalf of his principal, he receives £3 (or $\frac{3}{103}$ of the sum collected), for his trouble, and pays over to the principal only £97. The common mistake is, to suppose that for every £100 which he pays over to the principal he receives only £3 for his trouble; in other words, that from every £103 collected for the principal he deducts £3 (or only $\frac{3}{100}$ of the sum collected), and pays £100 over to the principal. The principle upon which trigonometrical functions are affected with particular algebraical signs is simply a convention, or general agreement for the sake of convenience, to denote contrariety of position or direction by contrary algebraical signs. Thus, if the length of a line measured from right to left be, as is usually the case, affected with a positive sign, the length measured in the contrary direction from right to left must be affected with a negative sign. This will be explained in the lesson in Algebra for the next number. Similarly, if lines or angles measured upwards are considered positive, those measured downwards must be considered negative. The other question, from an old examination paper, may be answered after a study of our forthcoming lessons on Trigonometry. As we have before observed, we think it is hardly fair to trouble us with such questions.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXXI.

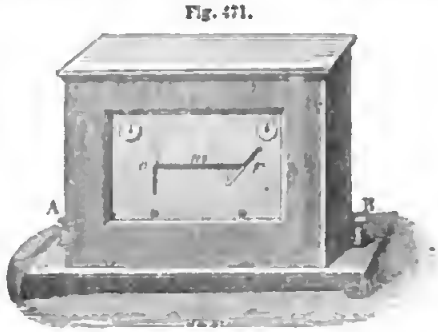
(*Continued from page* 275.)

DYNAMICAL ELECTRICITY.

PRACTICAL APPLICATIONS OF THE GALVANIC BATTERY.

Signal Electric Telegraph.—Fig. 471 represents the receiver of a signal telegraph constructed by M. Breguet. On the front side of a box is placed a white plate, upon which is traced a black stripe m, which is fixed, and has at its two ends movable radii, intended to serve as indicators, according to the angle which they make with the fixed line. The motion of these indicators is not continuous, but takes place at intervals of forty-five degrees, so that each of them may occupy eight different positions about the centre. The eight positions of one indicator, combined with the eight positions of the other, consequently give rise to sixty-four combinations, which constitute as many signals. However, as in each indicator the two horizontal signals are liable to be confounded,

Fig. 471.



only one of these positions is employed, so that for a single indicator there are only seven signals, which, combined with the seven of the other, make forty-nine different signals altogether. With regard to the motion of the indicators, it is produced in each case by clock-work, and an electro-magnet in communication with the wire of A B, which goes from one station to another, and is traversed by the current.

The apparatus just described is placed at the station to which communications are to be conveyed, and is called the *receiver*. At the place from which the communication is sent, is the *manipulator*, which has always more or less resemblance to that represented in fig. 468, omitting the dial. It consists of two wheels with eight teeth, which are turned with the hand, as that in fig. 468. These two wheels each serve to establish or close a distinct current, one of which goes along a wire to the electro-magnet of the indicator *o*, fig. 471, and the other along a second wire to the electro-magnet of the indicator r. During a complete revolution, each wheel allows the current to pass eight times, and interrupts it eight times, thus giving to the corresponding indicator eight successive positions. The cranks which move the two wheels also move at intervals of forty-five degrees, and thus successively occupy the same positions as their indicators. Lastly, to move these cranks, you turn one with the right hand and the other with the left at the same time.

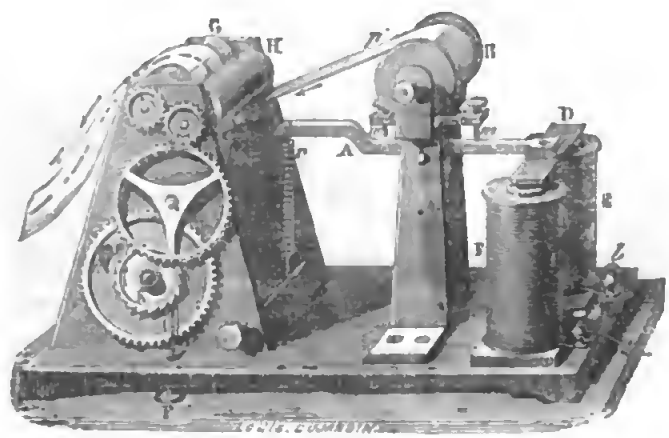
Morse's Writing Electric Telegraph.—The two sorts of telegraphs already described leave no trace of the despatches conveyed; and if any mistakes have been made in copying the signals, there is no means of correcting them. These inconveniences are remedied by writing telegraphs, which themselves trace the signals on a strip of paper as they are transmitted.

There are several telegraphs of this kind. We select for description that of Professor Morse, because it is very extensively used in the United States, and its construction is very simple.

Fig. 472 represents the apparatus which receives and writes the messages. The moving power which makes it act is here, as in the telegraphs already described, an electro-magnet E, in communication with two wires *a* and *b*, which connect it with the departure station. When the current passes through the wire of the electro-magnet, the latter attracts a soft iron armature D, which transmits the motion to a lever A; but directly the current is interrupted, the action of the electro-magnet is destroyed, and a spring *r* draws back the lever. The oscillations of the lever are regulated by two screws *m*, which are more or less lowered. Lastly, the lever A has at its extremity a blunt steel point O, which performs the part of a pencil for writing the signals. For this purpose, a strip of paper *p h* is first rolled round a wooden cylinder B, and then passes between two cylinders O H, turning in a contrary direction to the cylinder B, and thus acting as rollers to draw the paper in the direction indicated by the arrows. With regard to the motion of the cylinders, that is produced by a series of toothed wheels moved by a weight P, attached to a cord C, which is rolled round a cylinder K.

The cylinder H being covered with an elastic substance, such as gutta percha or caoutchouc, every time the electro-magnet acts, the blunt point A strikes the paper, and, without making a hole through it, leaves a dent in it, varying in form according to the length of time that the point has been in contact with the paper. If it only strikes it suddenly, it produces but a short stroke, thus (-); but if the contact has lasted for some time, a line of greater or less length (—) is produced. We may, therefore, by passing the current at the station of departure for an interval of various length, according as is desired, produce a short stroke or line, and consequently

Fig. 472.



combinations of short strokes and lines of different lengths. It remained to give these combinations a definite meaning. This was accomplished by representing the letters of the alphabet with the following combinations:—

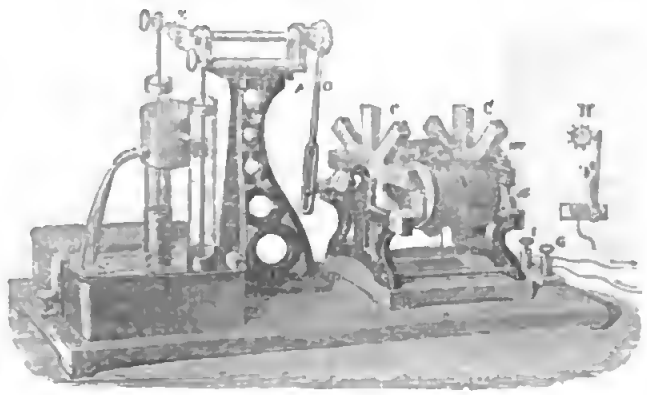
A short stroke and a line	(- —) represent the latter	A.
A line and three short strokes	(— - - -) „	B.
Three short strokes	(- - -) „	C.
A line and two short strokes	(— - -) „	D.

Proceeding similarly through the alphabet, we are enabled to write words and sentences. Care must be taken to leave a blank space between the letters.

Morse's telegraph is extensively used in America, as we have before observed, and is highly appreciated there. It cannot be denied, however, that this apparatus is attended with some difficulties in tracing signals for reading. In this country, as our readers are aware, it is customary to employ dial or needle telegraphs, the various signals being denoted by movements of the needles to the right or left different numbers of times.

Electro-Motive Machines.—Numerous attempts have been made to employ the attractive force of electro-magnets as a moving power in machines. Fig. 473 represents a

Fig. 473.



machine of this sort constructed by M. Froment. The current enters at o, rises through an elastic strip *a*, which successively touches at intervals all the teeth of a metallic wheel *m*, as is seen at x on the right of the figure. From the wheel *m* the current goes to two bobbins A and B, which are rolled round two soft iron cylinders, and form electro-magnets. The current goes out at I, and returns to the battery. Between the two electro-magnets is a horizontal axis, terminated at its extremities by two soft iron tourniquets c c, formed of eight branches, which are successively attracted by the two electro-magnets. The current is interrupted at *m*, at the moment when two opposite branches of the tourniquets get in front of the two electro-magnets. The two tourniquets then acting as fly-wheels, the rotatory motion continues; then the current beginning again to pass, the next branches are attracted, and so on continually. To the axis of the tourniquet is attached a crank, which transmits the motion to a connecting rod D, and this latter to a working beam R, which works two pumps.

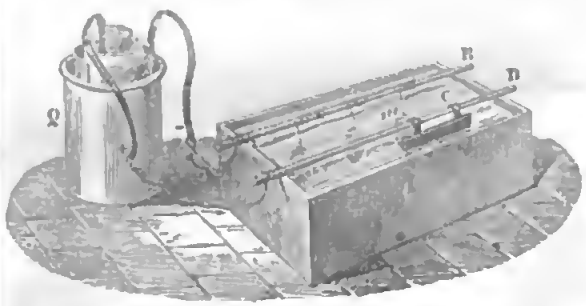
M. Froment has constructed an electro-motive machine of one-horse power. But, as we have already stated, the expense of the acids and zinc required for such machines renders them practically of little value in comparison with those worked by steam.

Galvanic Modelling.—By the slow action of an electric current, metals may be modelled by being precipitated from their solutions. This process, which depends upon the decomposition of salts by the battery, was discovered almost simultaneously by Mr. Spencer in this country and M. Jacobi in Russia, in the year 1838.

When we wish to take a copy of a medal or any other article by means of the galvanic battery, it is necessary first to procure an impress of it upon plaster of Paris, or, as it is usually expressed, to take a mould of it, that a metallic layer may be deposited upon the mould, and thus represent the medal in relief. If the medal is metallic, the simplest process for taking the mould is to use a fusible alloy, composed of five parts of lead, eight of bismuth, and three of tin. This alloy is poured into a shallow vessel, and at the moment when it is on the point of becoming solid, the medal is let fall into it from a small height, care being taken that it then remains perfectly unmoved. When the alloy has cooled, it is only necessary to give it a slight shake in order to detach the medal from it. The mould is then surrounded with a copper wire, intended to connect it with the negative pole of the battery. A thin layer of melted wax is then put round the mould and over the posterior surface, that the metallic deposit may be precipitated on the imprint alone.

To obtain a copy of a medal in copper, take a vessel filled with a saturated solution of sulphate of copper, and having placed upon it two brass rods B and D, fig. 474, one connected with the negative pole of a Bunsen couple, and the other with the positive pole, attach the mould *m* to the former, after having prepared it as above stated, and a plate of red copper o to the other. The current being thus closed, the sulphate of copper is decomposed. Its acid and the oxygen of the oxide go to the positive pole, while the copper alone goes to the negative pole, and is slowly deposited on the mould attached to the rod A. There may be several moulds suspended at the same time from that rod. At the expiration of about forty-eight hours, the mould becomes covered with a layer of solid copper,

Fig. 474.



firm but not adherent. However, in order completely to prevent its adherence, it is necessary to brush the mould with a fine brush which has been passed very lightly over a greasy substance, or to expose it to a resinous flame for a short time, so as to deposit upon it a foreign substance.

If the medal to be copied is in plaster, you cannot use the metallic alloy, but must adopt the following process:—Plunge it into a quantity of melted tallow, and take it out again directly, when it will become dry at once, in consequence of

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the tallow having penetrated the pores of the plaster. The plaster being cooled, cover it with black lead, by rubbing it with a soft brush impregnated with that substance. Then put round it a strip of card, and pour warm tallow upon it. The tallow on cooling will bear a faithful imprint of the original medal. The mould thus formed not adhering to the plaster, in consequence of the layer of black lead deposited upon it, is removed, and then covered with black lead to render it a good conductor. This mould, thus rendered metallic, is attached by a copper wire to the negative pole of the battery, as in the former case.

The plate of red copper c, which is placed at the positive pole, is simply intended to close the current. It also serves to keep the solution in a uniform state of concentration. Indeed, the acid and the oxygen, which go to the positive pole, combine with the copper of the plate, and constantly reproduce a quantity of sulphate of copper equal to that which has been decomposed by the current.

For galvanic modelling it is customary to make use of Daniell's battery, on account of the uniformity of its effect; but a single Bunsen couple answers very well, especially on the old scale, which is feebler, only care must be taken to put very little acid into the water in which the zinc is immersed.

Gilding and Silvering.—These two processes do not differ materially from those just described. The only point to be observed is, that the metallic layer deposited upon the articles to be gilded or silvered is much thinner than in the above cases. Brugnatelli, a pupil of Volta's, appears to have been the first who, in 1803, observed that it would be possible to gild with an alkaline solution of gold and a galvanic battery; but M. de la Rive was the first who really applied the battery to purposes of gilding. The processes of gilding and silvering were afterwards much improved by Messrs. Elkington, Ruoltz, and other philosophers.

For gilding and silvering, arrange the apparatus as shown in fig. 474. The solution of gold most in use is composed of one part of chloride of gold, one hundred parts of water, and ten of cyanide of potassium. The silver solution consists of a double cyanide of silver and potassium, in the ratio of one part of cyanide of silver, ten parts of cyanide of potassium, and a hundred parts of water. The article to be gilded or silvered is attached to the negative wire, and the positive pole is terminated by a leaf of gold or silver, which dissolves at a regular rate, and keeps the solution in a state of uniform concentration.

In these operations, the article to be gilded or silvered ought to be carefully scraped, and instead of a single Bunsen couple, three or four should be employed. The thickness of the deposit may be varied at pleasure, by leaving the article a longer or shorter time in the solution. As for the adherence of the deposit to the article, that is perfect.

BIOGRAPHY.—No. XXII.

COWPER.

A greater contrast than that which Cowper presents to Goldsmith is not to be found in literary history; for Cowper, in addition to being deeply and permanently religious, was a man of forethought, order and propriety, not without deep feelings, still less without impulse, but controuled and balanced in his outer life so as ever to make the best of circumstances. Yet Cowper and Goldsmith agree in one thing;—they were both unhappy men. Cowper indeed had periods of the deepest and most exquisite distress. Yet was Cowper's sorrow of a hallowed kind, and preferable, in our judgment, to the gay levity of Goldsmith. Cowper's sorrow was chiefly constitutional in its source; and though it was made more bitter, at times bitter as the bitterest gall, by gloomy views of Divine Providence, yet was it chastened, refined and elevated by the genial influence of the Gospel. In that important result literature had no mean share, for, at least, it afforded a relief and a resource in dark and weary hours.

William Cowper was born on the 15th of November, 1731, at Berkhampstead, in Hertfordshire, where his father was a clergyman. The boy was scarcely six years old when he lost his mother the memory of whom he preserved throughout life with a pious affection, to which he has given a beautiful utterance in the touching poem "On receiving my Mother's Picture." We extract a few lines:—

> Oh that those lips had language! life has passed
> With me but roughly since I heard thee last.
> Those lips are thine—thy own sweet smiles I see,
> The same that oft in childhood solaced me;
> Voice only fails, else how distinct they say,
> "Grieve not my child, chase all thy fears away!"
> I will obey not willingly alone,
> But gladly as the precept were her own;
> And while that face renews my filial grief,
> Fancy shall weave a charm for my relief,
> Shall steep me in Elysian reverie,
> A momentary dream, that thou art she.

His own sufferings are forcibly described and presented in a striking and delightful contrast, a contrast becoming a son and a Christian:—

> Thou, as a gallant bark from Albion's coast
> (The storms all weathered and the ocean crossed),
> Shoots into port at some well haveued isle,
> Where spices breathe and brighter seasons smile,
> There sits quiescent on the floods, that show
> Her beauteous form reflected clear below,
> While airs impregnated with incense play
> Around her, fanning light her streamers gay;—
> So thou, with sails how swift! hast reached the shore
> "Where tempests never beat nor billows roar;"
> And thy loved consort on the dangerous tide
> Of life, long since has anchored at thy side.
> But me, scarce hoping to obtain that rest,
> Always from port withheld, always distressed,
> The howling winds drive devious, tempest tossed,
> Sails rent, seams opening wide and compass lost;
> And day by day some current's thwarting force
> Sets me more distant from a prosperous course.
> But oh! the thought, that thou art safe and he!
> That thought is joy, arrive what may to me.
> My boast is not that I deduce my birth
> From loins enthroned and rulers of the earth;
> But higher far my proud pretensions rise—
> The son of parents passed into the skies.
> And now, farewell!—Time unrevoked has run
> His wonted course, yet what I wished is done.
> By contemplation's help, not sought in vain,
> I seem to have lived my childhood o'er again:
> To have renewed the joys that once were mine,
> Without the sin of violating thine;
> And while the wings of fancy still are free,
> And I can view this mimic show of thee,
> Time has but half succeeded in his theft—
> Thyself removed, thy power to soothe me left.

Cowper possessed the shy temperament to great excess. Hence he shunned the face of strangers. Even in boyhood and youth he was timid and retiring. The school and the play-ground were for him without their ordinary charms. He never knew the robust pleasures of the cricket-ground and the tennis-court. Yet he had prospects in the civil service of his country, could he only acquire the necessary self-confidence. The attempt was followed by signal failure. With brighter promise than that of Addison, he endured disappointment still more complete and distressing. Yet the flower that cannot endure the glare of the open light of day, may flourish pre-eminently in the fostering warmth and softened brilliancy of domestic life. And so Cowper had a very keen yet delicate relish for home pleasures. His writings are full of proofs. Indeed it is their family tone which gives them their peculiar charm. Read the following—

A WINTER EVENING AT HOME.

> Now stir the fire, and close the shutters fast,
> Let fall the curtains, wheel the sofa round,
> And while the hubbling and loud-hissing urn
> Throws up a steamy column, and the cups,
> That cheer but not inebriate, wait on each,
> So let us welcome peaceful evening in.
> O Winter! ruler of the inverted year,
> I love thee, all unlovely as thou seem'st
> And dreaded as thou art! Thou hold'st the sun
> A prisoner in the yet undawning east,

Shortening his journey between morn and noon,
And hurrying him, impatient of his stay,
Down to the rosy west; but kindly still
Compensating his loss with added hours
Of social converse and instructive ease,
And gathering at short notice in one group
The family dispersed, and fixed thought,
Not less dispersed by daylight and its cares.
I crown thee king of intimate delights,
Fire-side enjoyments, home-born happiness,
And all the comforts that the lowly roof
Of undisturbed retirement, and the hours
Of long, uninterrupted evening know.
No rattling wheels stop short before these gates;
No powdered pert, proficient in the art
Of sounding an alarm, assaults these doors
Till the street rings, no stationary steeds
Cough their own knell, while, heedless of the sound,
The silent circle fan themselves and quake;
But here the needle plies its busy task,
The pattern grows, the well-depicted flower,
Wrought patiently into the snowy lawn,
Unfolds its bosom; buds, and leaves, and sprigs,
And curling tendrils, graefully disposed,
Follow the nimble finger of the fair:
A wreath that cannot fade, of flowers that blow
With most success when all besides decay.
The poet's or historian's page by one
Made vocal for the amusement of the rest;
The sprightly lyre, whose treasure of sweet sounds
The touch from many a trembling chord shakes out:
And the clear voice symphonious, yet distinct,
And in the charming strife triumphant still,
Beguile the night, and set a keener edge
On female industry: the threaded steel
Flies swiftly, and unfelt the task proceeds.
The volume closed, the customary rites
Of the last meal commence. A Roman meal;
Such as the mistress of the world once found
Delicious, when her patriots of high note,
Perhaps by moonlight, at their humble doors,
And under an old oak's domestic shade,
Enjoyed, spare feast! a radish and an egg.
Discourse ensues, not trivial yet not dull,
Nor such as with a frown forbids the play
Of fancy, or prescribes the sound of mirth:
Nor do we madly, like an impious world,
Who deem religion frenzy, and the God
That made them an intruder on their joys,
Start at his awful name or deem his praise
A jarring note. Themes of a graver tone,
Exciting oft our gratitude and love,
While we retrace with memory's pointing wand,
That calls the past to our exact review,
The dangers we have 'scaped, the broken snare,
The disappointed foe, deliverance found
Unlooked for, life preserved, and peace restored—
Fruits of omnipotent, eternal love.
'O evenings worthy of the gods!' exclaimed
The Sabine bard. O evenings, I reply,
More to be prized and coveted than yours!
As more illumined, and with nobler truths,
That I, and mine, and those we love enjoy.

Human nature is a bundle of strange contrasts. The most humorous actor on the stage is the dullest fireside companion. A heart running over with grief, and tossed to and fro with fear, may have a corner full of fun. And so was it that Cowper, who wrote hymns of the deepest pathos, wrote also the diverting history of John Gilpin. That ballad is too well known to be quoted here; one of less celebrity but of solemn beauty is that which is inscribed

ON THE LOSS OF THE ROYAL GEORGE.

Toll for the brave!
 The brave that are no more!
All sunk beneath the wave,
 Fast by their native shore!

Eight hundred of the brave,
 Whose courage well was tried,
Had made the vessel heel,
 And laid her on her side.

A land breeze shook the shrouds,
 And she was overset;
Down went the Royal George,
 With all her crew complete.

Toll for the brave!
 Brave Kempenfelt is gone;
His last sea-fight is fought,
 His work of glory done.

It was not in the battle;
 No tempest gave the shock;
She sprang no fatal leak;
 She ran upon no rock.

His sword was in its sheath;
 His fingers held the pen,
When Kempenfelt went down,
 With twice four hundred men.

Weigh the vessel up,
 Once dreaded by our foes!
And mingle with our cup,
 The tear that England owes.

Her timbers yet are sound,
 And she may float again,
Full charg'd with England's thunder,
 And plough the distant main.

But Kempenfelt is gone,
 His victories are o'er:
And he and his eight hundred
 Shall plough the waves no more.

Cowper's sorrow was not selfish. A larger heart rarely beat in a human frame. In part his sufferings came from his love. A brother's sympathy with men made him keenly solicitous respecting their future condition; and could he have been satisfied that that condition would be one of joy, he would in the assurance have found peace respecting his own salvation. But the darker the future, the more desirous was he to throw a radiance over the present. Hence in part those literary labours which not only lightened his own burden and cheered his own heart, but threw a light no less varied than bright over social life as it lay beyond the narrow precincts of his own home. Nay, so truly Christian were his sympathies, that he pitied those most who suffered most. Accordingly he has more than once expressed his compassion for the slave, as in these lines:—

NEGRO SLAVERY.

I would not have a slave to till my ground,
To carry me, to fan me while I sleep,
And tremble when I wake, for all the wealth
That sinews bought and sold have ever earned.
No; dear as freedom is, and in my heart's
Just estimation prized above all price,
I had much rather be myself the slave,
And wear the bonds, than fasten them on him.
We have no slaves at home—then why abroad?
And they themselves, once ferried o'er the wave
That parts us, are emancipate and loosed.—
Slaves cannot breathe in England; if their lungs
Receive our air, that moment they are free;
They touch our country, and their shackles fall.
That's noble, and bespeaks a nation proud
And jealous of the blessing. Spread it then,
And let it circulate through every vein
Of all your empire; that where Britain's power
Is felt, mankind may feel her mercy too.

From the year 1767 Cowper resided at Olney in Buckinghamshire, with the clergyman of which place, the Rev. John Newton, whose religious opinions he shared, he lived on terms of close intimacy. There he busied himself with those poetical compositions which have gained for him a niche in the English poetical Walhalla, though at first they met with an uncordial and tardy reception. Cowper's chief poem is "The Task," which like all his writings abounds in good sense and generous feeling expressed in pure and idiomatic English. In sentiment lay Cowper's forte; with imagination he was scantily gifted. His poetry, in consequence, is without the higher flights of genius. The latter days of his painful existence he devoted in part to the

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translation of Homer, and has produced a work less unlike the original than tho version of Pope. As an epistolary writer Cowper has great merit. In this species of composition his love of the natural and the simple, as well as his earnest and impressive nature, stood him in good stead, so that the collection of his letters published after his death is a model of style as well as a repertory of just, pure, and lofty thought. Cowper died on the 25th of April, 1800. The best edition is that by Southey, who has written a very interesting memoir of him ("Works and Life of Cowper;" 15 vols. 12mo. London: Baldwin).

LESSONS IN GREEK.—No. LIX.

By John R. Beard, D.D.

Import and use of the Dative.

The Dative denotes the person or thing which is mediately assisted by the action of the verb, and consequently serves to express the mediate or remote object.

The use of the dative has in the Greek a wide application, for it expresses not only those modifications of meaning which take the dative in other languages, but also those which in Latin require an ablative or a preposition. The dative and the ablative differ in this, that the former denotes that in which an action falls, the latter that from which an action proceeds. These general significations are more or less modified by usage. They may, however, serve as a basis for a division of this branch of our subject into two heads, the proper dative, and the dative expression of ablative relations; the former being represented by our English *to* and *for*, the latter by our English *from*, *by*, *in*, *with*. These statements are, however, only approximative, and in order to a right understanding of the Greek use of these and other cases, the Greek classics must be carefully and minutely studied.

The Proper Dative.

The dative is employed to express proximity in space, as well as conditions which cannot be realized without such proximity. Hence the dative is used in Greek with words that signify

1. Near, nearness, approach, and especially verbs which denote

2. To meet, come together, be together, whether in a friendly or unfriendly manner; also verbs which signify to have intercourse with, to discourse, to stand by, assist, serve, to contend, to withstand, to yield, to hinder, to mix, to impute, to add, to promise, refuse;

3. Also verbs which signify any kind of mental or moral communication from one person to another, whether by deed, as to give, to bestow, to lend, to send; or by word, as to say, to announce, to reply, to speak to, to give permission, to command.

Of these verbs several have in English a dative construction, inasmuch as they take the preposition *to* after them; others, however, take another preposition, and some have no preposition and govern their object immediately in what may be termed the accusative case. Hence you cannot determine in what case an object in Greek should be by either studying the general import of the cases, or by observing what is the relation in the English between the verb and the object. Such studies are indeed useful when they are pursued so as to throw light on the general doctrine and application of cases, or when they are pursued so as to bring into view the diversities that obtain between the Greek idiom and the English idiom. But in particular instances if you would know what case a Greek verb takes, you must consult Greek usage, and as an aid to a knowledge of Greek usage, you must also study Greek analogy.' By analogy I mean conformity to rule. Such conformity is found in all languages. Thus, certain ideas, and certain notions are in English or in Greek connived of under certain relations. Hence a class of ideas and actions will have the same relations in all instances. If you know the class relation you know the individual relation. For example, if you know that verbs expressive of proximity take a dative, then by analogy every word expressive of proximity must be followed by a dative. Grammatical rules are very liable to exceptions. Still grammatical rules assist, and when they are not blindly or slavishly followed, they render no small service; only in studying Greek, suspect English analogy, as in studying English, a Greek would have to suspect Greek analogy. Examples of the classes of verbs above mentioned are found in the following exercise.

As exceptions to the rules just laid down, you must mark the adverbs *εγγυς* and *πλησιον*, near, which when they denote material proximity take a genitive, whilst in their metaphorical application, they are connected with a dative. The verbs *εγγιζειν* and *πλησιαζειν*, to approach, are also construed with both a genitive and a dative. In agreement with the English *κελευω*, I command, takes an accusative with an infinitive; as

κελευω σε σιγᾶν
I command you to be silent.

With *ἑπεσθαι* and *ακολουθειν*, instead of the simple dative, we find the dative with *ἁμα* and *συν*, when a common operation is denoted, also the genitive with *μετα*.

Many verbs, one of whose components is a preposition, either *συν*, *εν*, *προς*, *επι* or *παρα*, take their object in the dative, because they involve the idea of being near or being with; thus we have these constructions:

Verbs compounded with Prepositions

συνεῖναι φιλοις, to be present with friends.
συμπλεῖν τῳ ανδρι, to sail with the man.
συνηδεσθαι τοις ευτυχοῦσιν, to rejoice with the fortunate.
ενεῖναι τῳ σωματι, to be in the body.
εμβαλλειν προθυμιαν τοις στρατιωταις, to inspire the soldiers with ardour.
εμμενειν τοις ὁρκοις, to be faithful to oaths.
προεναι τῳ βασιλεῖ, to go into the king's presence.
τον νουν προσεχειν τοῖς λογοις, to pay attention to what is said.
επιεναι τοις πολεμιοις, to go against the enemy.
επιχειρεῖν τῳ εργῳ, to put your hand to the work.
παρεῖναι τοις φιλοις, to be in the midst of friends.

In externals, resemblance, and likeness: and in internals, community, relationship, unanimity, inclination, correspond to nearness and approximation in space. Accordingly the dative is used to express the ideas of resemblance, equality, comparison, advantage, necessity, conduciveness, possession, relationship, friendliness and their opposites. Instances are given in the exercise subjoined.

The pronoun *ὁ αυτος*, in Latin idiom, *the same*, as expressive of absolute equality, takes the compared object in the dative. For the sake of brevity, the Greeks with *ὁ αυτος* and adjectives signifying equality and likeness, leave the proper point of comparison unmentioned and put the object in the dative, which in English would be in the genitive, dependent on the proper point of comparison: *e. g.*

Abreviated and Idiomatic in full.

ἡ δεσποινα ὁμοιαν ταις δουλαις ειχε την εσθητα.
ἡ δεσποινα ὁμοιαν τῃ των δουλων εσθητι ειχε την εσθητα.
The mistress had raiment like that of her slaves.

As the adjectives which express the idea of property govern a dative, so the verbs *ειναι*, *ὑπαρχειν*, and *γιγνεσθαι* with a dative, denote possession, so that *εστι μοι* is equivalent to our "I have." Sometimes the idea of acquiring or gaining is involved in this construction: *e. g.*

Possession,	*εστι μοι πατηρ,*	*I have a father.*
Acquisition,	*τοδε γιγνεται μοι,*	*I acquire this.*
Gain,	*τί πλεον μοι εστι,*	*What advantage do I get?*

Some substantives which either in themselves or from their derivation involve the relation implied in the dative in Greek, take after them an object in the dative. Such substantives are *φιλος*, *εχθρος*, *συμμαχος*, *δοσις*, *κοινωνια*, *ὁμοιοτης*, *βοηθεια*, *ὑπηρετης*, &c. Thus the Greeks said *ὑπηρετης τοις νομοις*, literally a servant *to* the laws; *φιλοις βοηθεια*, as we say, assistance *to* friends: *e. g.*

τοις δικαιοις συμμαχος ὁ Θεος.
God is an ally to the just.

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As exceptions to these rules, observe that the adjectives ἰδιος, οἰκεῖος, κοινος and ἀλλοτριος often take the genitive; with ἱερος, sacred, the genitive is the regular construction: *e. g.*

ἡ ἑστια ἱερα ἐστι Θεων
The hearth is sacred to the gods.

The verbs προσηκει and πρεπει, *it is proper, it becomes*, admit an accusative as well as a dative with an infinitive; δεῖ has generally an accusative, and χρη always. Consult the instances in the exercise. The verb ἀρεσκειν besides the meaning of *to please* for which the dative is requisite, has also the meaning of *to satisfy*, in which case it governs the accusative.

In general, the dative implies that for or against which an action takes place; and so involving advantage or disadvantage, convenience or utility, is called the *dativus commodi aut incommodi*. Accordingly you find in the dative the person to or for whose honour anything is done, so the Greeks said θυειν τινι, to sacrifice in honour of some divinity, and in the extension of this usage στεφανοῦσθαι τινι, to wear a chaplet in honour of; and ὑμνοι θεοῖς, hymns in honour of the gods. The dative is also employed in participles, adjectives, and nouns, which betoken a condition or occupation, in order to denote relations of place, or determination and continuance: *e. g.*

Ἐπίδαμνος ἐστι πολις ἐν δεξιᾷ ἐσπλεοντι τον Ἰονιον κολπον.
Epidamnus is a city on the right hand to one sailing (as you sail) into the Ionian gulph.
ὁρα εἰ σοι βουλομενῳ ἐστιν ἁ λεγω.
See if what I say is satisfactory to you.

The dative of the personal pronoun, is often used to show at the person indicated by the pronoun takes a special interest in the thing mentioned. This usage as being connected with feeling, is termed the *dativus ethicus*.

The Dative denoting Ablative Relations.

The dative in Greek serves not only to indicate the object, but also to denote accessory attributives to the subject and the predicate. The accessory attributives expressed by the dative are relations of place—the local dative; relations of time—the temporal dative; relations of influence or intermediate circumstance—the dynamic dative or dative of power.

The local dative without a preposition is for the most part confined to poetry, and is used especially in the epic writers, where we find such phrases as these, αἰθερι ναιων, dwelling in the air; ὑψηνος ἀκροταιῃ σορυφῃ, sitting on the loftiest summit; while in prose the preposition ἐν would be prefixed to such datives. In prose the dative without a preposition is found mostly with names of cities, &c. Μαραθωνι, at Marathon; Ἐλευσῖνι, at Eleusis.

The temporal dative without a preposition is used only when a certain point of time is mentioned, as that at which an event took place: *e. g.*

τριτῃ μηνος Ἀνθεστηριῶνος.
On the third day of the month Anthesterion.

The dynamic dative denotes the power or means by which any thing is effected: *e. g.*

τοις ὀφθαλμοις ὁρῶμεν
We see with the eyes.

Exercises.—Greek-English.

Ὁρω ὑμιν ἀντιπαλους προϊοντας, οἷς ὑμεις οὐ δυναμεθα μαχεσθαι. Τοις φρονιμωτατοις πλησιαζε. Οἱ συμμαχοι οἱ νῦν προϊγενομενοι παραμενοῦσιν ὑμιν καὶ ὑστερον. Κακοις ὁμιλῶν πυνος ἐκβησῃ κακος. Μὴ ἐριζε τοῖς γονεῦσι, κἂν δικαια λεγῃς. Ἀλλοις μεν πολεμοῦσι, τοῖς δε Σκυθαις ουκ ἐθελουσι διαγωνιζεσθαι. Σωκρατης πολλακις διελεγετο τοις τεχνιταις. Οὐ παντα λευκα οἷς μελανα μὴ μεμικται. Πολλα ἀγαθα οἱ θεοι παριχουσι τοῖς ἀνθρωποις. Καλον πειθαρχεῖν τοις νομοις, τῃ δε πατριδι κινδυνευουσῃ βοηθεῖν. Τον στρατιωτην ἑπεσθαι χρη τῳ ἡγεμονι. Ὑπηρετειτε τῷ ἀρχοντι, ὁ τι ἂν προσταττῃ ὑμιν. Πᾶς πλοῦτος ὑπεικει τῃ ἀρετῃ. Ὁ σιδηρος ἰσοι ἐν τῳ πολεμῳ τους ἀσθενεῖς τοις ἰσχυροῖς. Δουλῳ ἰσικας. Οἱ πονηροι ἀλληλοις ὁμοιοι. Οὐ δεῖ ἰσον τους κακους τοῖς ἀγαθοις ἐχειν. Τῳ κακῷ πρεπει δουλευειν. Ἡ πλημονη βλαβερα μεν τῳ σωματι, βλαβερα δα τῇ ψυχῇ. Ἀγαθοι ἀνδρες ὠφελιμοι τοις πολεσιν. Χρησιμη τοῖς ἀνθρωποις ἡ ἰατρικη. Ἡ δικαιοσυνη ου μονον τῳ ἐχοντι ὠνησιτελεῖ, ἀλλα καὶ τοῖς ἀλλοις. Ὁ ἀγαθος τῳ ἀγαθῷ μονος φιλος. Οἱ πονηροι ὁμοιως δοκουσιν πλληλοις ἐχθροι μαλλον η φιλοι πεφυκεναι. Τυραννος ἁπας ἐχθρος ἐλευθερια καὶ νομοις ἐναντος. Κοινον τι χαρᾷ καὶ λυπῃ ζαερνα ἐστιν Ἐνιοις μεν πανν ὀλιγα ἀρκεῖ, ἐνιοις δε καὶ κανυ πολλα οὐχ ἱκανα ἐστιν. Οὐ πασιν οἱ αὐτοι πιστοι φαινονται. Χαριν σοι ἐχω πλειστην, ὁτι τους πολλους ὁμογνωμονας ὑμῖν ἐποιησας. Οἱ Ἀθηναῖοι ἀπηχθανοντο τοις Ἕλλησιν. Ἀριστε πᾶσι καὶ συ μη σαυτῳ μονον. Τί χαλεπαινεις τῳ θεραποντι; Ὀργιζεσθαι τοις νουθετοῦσιν ἀδικον. Τῳ βασιλεῖ συ φθονοῦμεν της δυναμεως. Οὐδεις πωποτε ἐφθονησα. Μη μοι φθονησῃς τῆς σοφιας. Δικαια πραττει ὁ τοῖς νομοις πειθομενος, πδικα δε ὁ τουτοις ἀπειθῶν. Πειθαρχεῖν δεῖ τῷ πατρι. Τῳ ψευδει λεγῳ μη πιστευε. Τί ποτ' ἐστιν ὡ πιστευεις; Κοινα τοῖς φιλοις τα των φιλων ἀγαθα. Νομιζετε της αὐτῆς ζημιας ἀξιους εἶναι τους συγκερυπτοντας τοῖς ἁμαρτανουσιν. Οὐ τῶν αὐτῶν ουτε ἐργων ουτε λογων ἐστιν ἡ νοσης τῳ γηρᾳ. Των πλουτο τοιουντων μεν ἐστι χρηματα, τοῖς δε ἀγροι, τοις δε βοσκηματα. Οὐδεν ουτως ὑμετερον ἐστιν, ὡσπιο ὑμεῖς ὑμῖν αὐτοῖς. Φυσει ὑπαρχει τοις ἐθελουσι πονεῖν καὶ κινδυνευειν τα των ἀμελουντων. Πολλοι καὶ ἀγαθοι φιλοι ἐισι ἐμοι. Τῶν καλῶν καὶ τῶν κακῶν τα μεν φυσει καὶ τυχῃ γιγνεται τοῖς ἀνθρωποις, τα δε ἐξ ἐπιμελειας καὶ διδαχης. Τι ἐμοι καὶ σοι; Τί ὑμῖν ἐσται, ἐαν σοι πειθωμεθα; Φιλος μοι δοκεῖ εἶναι μαλιστα ὁ ὁμοιος τῳ ὁμοιῳ. Ὁ ἀδικος ἐχθρος καὶ ἑαυτῳ καὶ τοις δικαιοις. Ἀποβλεπε προς την νεαν ὑμῖν πολιν. Τους σοφους προστηκει των πολεων ἀρχειν. Τῷ κακῷ προσηκει αθλιῳ εἶναι. Πρεπει κηρυκα παντ' ἀπαγγελλειν σαφῶς. Δει σε παρεῖναι. Τί με χρη ποιεῖν; χαλεπον εὑρειν νομον ὑς παντας ἀρεσκει. Ἡμερα ἡν πεμπτη ἐπιπλευσει τοις Ἀθηναιοις. Θυομενῳ οἱ ὁ ἡλιος ἠμαυρωθη. Ἀποροῦντι αὐτῷ ἐρχεται ὁ Προμηθευς. Θαυμαζω εἰ μη ασμενοις ὑμιν ἀφιγμαι. Ἐπαινεθωμεν, εἰ σοι ἡδομενῳ ἐστιν. Ἑκαστος ουχι τῳ πατρι καὶ τῃ μητρι μονον γεγενηται ἀλλα καὶ τῃ πατριδι. Ἐγω ταῦτα ἐπραξα τῃ σῃ μεν ἐυδαιμονιᾳ, τῃ ὲ ἐμῇ κακοδαιμονιᾳ. Δημοσθενης χαλκοῖς καὶ ἀδαμαντινοις τειχεσι την τῶν Ἀθηναιων χωραν ἐτειχισε, τῃ τῶν Ἐυβοεων καὶ Θηβαιων συμμαχιᾳ. Τοις χρημασι κακῶς χρῶνται οἱ πολλοι. Ἀθηναῖοι δισχιλιοις ὁπλιταις καὶ ἱππευσι διακοσιοις ἐστρατευσαν ἐπι Χαλκιδεις.

English-Greek.

Good men are like good men. Good citizens are born for the state. Wise men are born for the world. I have a horse. He has a horse. They have hens. You have flocks. What has the boy to do with the girl? Young men obey your teachers. He uses his property ill. What will he gain if he obeys the laws? The man is friendly to us. The boy is like his mother. Unjust men are hostile to the just. It is proper for boys to be silent. You must go home. I shall never envy any one. They envied me. They used my books. At Athens are many statues in honour of the gods. The gods bestow riches on bad and on good men. A falsehood is hurtful to the soul. To learn is useful to all. The Lacedemonians make war on the Athenians.

Γεωμαι.

11. Αἴθρον δι ἀστερες μηνουσι.
12. Μακαρα αθριὴν αιῶνα ἐῶρον ἐστι τον ἐν ὑψει ναιοντος.
13. Εἰ Θιον τις ανηρ ελπιται τι λαθιμενος ἐρξων, ἁμαρτανει.
14. Οιαξ τον βιον ὁ νομος Θιου.
15. Τοσ ἁγιος χῶρος ἐν νιφ.
16. Ευχαι ἀγιρωχων ψωα ἐμπροσθιν τον Θεοῦ.
17. Νιφος φρενος αυγη ἁγιας γραφης ἐιει.
18. Πιστεως ἐστιν ἱρκος η σφραγις.
19. Ὁ αιτῶν ζαγη ληψεται.

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20. Ψευδει πολλακις Οριων τους ναυτας.
21. Ουδε ὁ Ζευς ουθ' ὑων παντας ανδανει, ουδ' ἀνιχων.
22. Εν ἀλσει της πιστεως ναβλα και νοῖρον.
23. Χονδρος της πιστεως πονταχῆ βλαστανει.
24. Τοῦ Οιοῦ ἐιξια ἐιαμπαξ κοπιδι αλιγεια.
25. Ερευνᾶτε τας γραφας τας της σωτηριας πηγας.
26. Το ἐισαζειν ἐχθρος πιστεως.
27. Χηραμους και ηρον της χθονος ἐυρχεται αλια.
28. Μυουμενοι βιον ἀγιοτητα λαμβανουσι.
29. Τουτο ὁρᾳι, και μακαρ εσῃ.
30. Ευχας τοις Θειοις ου βοας θυι.

VOCABULARY AND REMARKS.

11. *Αιθος, ὁ, aithr* (our *æther*) *ερος, ρος, ὁ και ἡ, the ether, clear, bright sky; μηνυω, I show.*
12. *Μακαρ, αρος* (all three genders), *happy; αθριω, I behold; ναιω, I dwell.*
13. *λανθανω, I lie hid; λαθεμενος*, an epic form for *λαθων ἰρζω, I do*, fut. *ἰρξω*, aor. *ἰρξα*, pf. *εοργα.*
14. *οιαξ, ἀκος, ὁ, a rudder, helm.*
15. *ἁγος, εος, το, holiness.*
16. *αγερωχος, ον*, (from an intensive, *αγιραοχος, well gifted*), *proud; ψωα, ας, ἡ, a foul smell.*
17. *Νεφος, ους, το, a cloud; ανυη. ης, ἡ* (compare Augustus), *splendour; ἐι-ειω* (*ἐι-ημι*), *I send through, dissipate.*
18. *ἱρκος, εος, το, a hedge; σφραγις, ἰδας, η, a seal.*
19. *δανος, εος, το, a gift.*
21. *ὑω, I rain; ανιχω, I keep back.*
22. *ἁλσις, εως, ἡ, the springing, the bounding, pulsation*, from *ἁλλομαι, I leap; ναβλα, ης, ἡ, a musical instrument; ναῖρον, an Indian perfume.*
23. *χονδρος, ου, ὁ, a grain of wheat, seed,*
24. *Διαμπαξ* (*ζια, ιν, ωας*) *thoroughly; αλιγκιος, α, ον, like.*
27. *χηραμος, ου, ὁ, a cleft, a cavern, recess; ηρον, ου, το, the belly, αλεα, ας, ἡ, warmth, warmth of the day.*
28. *μυω, I close, I close the mouth, I am initiated.*

LESSONS IN ITALIAN GRAMMAR.—No. XLVI.

Gire, to go. (Defective Verb.)

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *gire*, to go	Past: *essere gito*, to have gone
[No Present Gerund.]	Past Gerund: *essendo gitó*, having gone
Past Participle: *gito*, gone	

INDICATIVE MOOD.

Present.	*giste*, you went
Gito, you go	*girono*, they went
Imperfect.	Future.
Giva or *gia*, I was going	*Girò*, I shall or will go
givi, thou wast going	*girà*, he will go
giva or *gia*, he was going	*girémo*, we will go
givámo, we were going	*giréte*, you will go
givate, you were going	*giránno*, they will go
givano or *giano*, they were going	Conditional Present.
Indeterminate Preterite.	*Giréi*, I should or would go
Gisti, thou wentest	*girésti*, thou wouldst go
gi or *gío*, he went	*girébbe*, he would go
gimmo, we went	*girémmo*, we would go
	giréste, you would go
	girébbero, they would go

IMPERATIVE MOOD.

Gite, go (ye or you)

SUBJUNCTIVE MOOD.

Imperfect.	*che gisimo*, that we might go
Che gissi, that I might go	*che giste*, that you might go
che gissi, that thou mightst go	*che gissero*, that they might go
che gisse, that he might go	

I're, to go. (Defective Verb.)

INFINITIVE MOOD.

Present: *ire, to go* | Past Participle: *ito*, gone

INDICATIVE MOOD.

Present.	Future.
I'to, you go	*Iréme*, we will go
Imperfect.	*írete*, you will go
I'va, I was going	*iránno*, they will go
irano, they were going	

IMPERATIVE MOOD.

I'te, go (ye or you)

Morire, to die.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *morire*, to die	Past: *E'ssere mórto*, to be dead
Present Gerund: *morèndo*, dying	Past Gerund: *essèndo mórto*, being dead
Past Participle: *mórto*, dead	

INDICATIVE MOOD.

Present.	Future.
Muójo or *muóro*, I die	*Morrò* or *morirò*, I shall or will die
muóri, thou diest	*morrài* or *morirài*, thou wilt die
muóre or *muór*, he dies	*morrà* or *morrirà*, he will die
muojámo or *moriámo*, we die	*morrémo* or *morirémo*, we will die
morite, you die	*morrète* or *morirète*, you will die
muójono or *muórono*, they die	*morránno* or *morirránno*, they will die
Imperfect.	Conditional Present.
Moríva or *moría*, I was dying	*Morréi* or *morirèi*, I should or would die
moríri, thou wast dying	*morrésti*, or *morirésti*, thou wouldst die
moríva or *moría*, he was dying	*morrébbe, morirebbe, morría, moriría*, he would die
moriámo, we were dying	*morrémmo* or *morirémmo*, we would die
morivète, you were dying	*morrésteo* or *moriréste*, you would die
morivano, morìano, or *moricno*, they were dying	*morrebbero, morirébbero, moririano, morrieno*, they would die
Indeterminate Preterite.	
Morii, I died	
moristi, thou diedst	
morì or *morío*, he died	
morimmo, we died	
moriste, you died	
morirono, morire, or *morir*, they died	

IMPERATIVE MOOD.

[No First Person.]	*muojámo* or *morìamo*, let us die
Muóri, die (thou)	*morite*, die (ye or you)
muójo, or *muóra*, let him die	*muojano* or *muórano*, let them die

SUBJUNCTIVE MOOD.

Present.	*che muójano* or *muórano*, that they may die
Che muója or *muóra*, that I may die	Imperfect.
che muóji, muóra, móri, móra, muja, that thou mayst die	*che morissi*, that I might die
che muójd or *muóra*, that he may die	*che morissi*, that thou mightst die
che muójamo, moriámo, or *moiámo*, that we may die	*che morisse*, that he might die
che muojáte, moriáte, or *moiáte*, that you may die	*che morissimo*, that we might die
	che morisse, that you might die
	che morissero, that they might die

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So conjugate—

Premorire, to die before | *Rimorire*, to be extinguished

Salire, to go up.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *salire*, to go up	Past: *essere salito*, to have gone up
Present Gerund: *salendo*, going up	Past Gerund: *essendo salito*, having gone up
Past Participle: *salito*, gone up	

INDICATIVE MOOD

Present.

Salgo or *saliseo*, I go up
sali or *saliseí*, thou goest up
sale or *salisce*, he goes up
sagliámo or *saliámo*, we go up
salite, you go up
sálgono, *saliscono*, or *sógliono*, they go up

Imperfect.

Saliva, or *salia*, he was going up
salivi, thou wast going up
saliva or *salia*, he was going up
salivámo, we were going up
salivate, you were going up
salivano or *saliano*, they were going up

Indeterminate Preterite.

Salii or *salsi*, I went up
salisti, thou wentest up
salì, *salse*, or *salío*, he went up
salimmo, we went up
salíste, you went up
salirono, *salsero*, *saltro*, *salir*, they went up

Future.

Salirò, I shall or will go up
salirái, thou wilt go up
salirà, he will go up
saliremo, we will go up
salirete, you will go up
saliránno, they will go up

Conditional Present.

Salirèi or *saliría*, I should or would go up
salirésti, thou wouldst go up
salirébbe, or *saliría*, he would go up
salirémmo, we would go up
saliréste, you would go up
salirébbero or *salirísno*, they would go up

IMPERATIVE MOOD.

[No First Person.]
Sáli, go up (thou)
sálga or *sóglia*, let him go up
sagliámo or *salghidmo*, let us go up
salite, go up (ye or you)
sálgano, or *sógliano*, let them go up

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che sálga, *salisca*, or *sóglia*, that I may go up	*che salissi*, that I might go up
che sálga or *salisca*, that thou mayst go up	*che salissi*, that thou mightst go up
che sálga, *salisca*, or *sóglia*, that he may go up	*che salisse*, that he might go up
che sagliámo or *saliámo*, that we may go up	*che salissimo*, that we might go up
che sagliáte or *saliáte*, that you may go up	*che saliste*, that you might go up
che sálgano, *saliscano*, or *sógliano*, that they may go up	*che salissero*, that they might go up

So conjugate—

Assalire, to attack | *Risalire*, to attack again
Risalire, to go up again | *Soprassalire*, to attack unexpectedly

Seguire, to follow.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *seguire*, to follow	Past: *avére seguito*, to have followed
Present Gerund: *seguéndo*, following	Past Gerund: *avéndo seguito* having followed
Past Participle: *seguito*, followed	

INDICATIVE MOOD.

Present.

Séguo or *siégue*, I follow
séguí or *siégui*, thou followest
segue or *siégue*, he follows
seguiámo, we follow
seguite, you follow
séguono or *siéguono*, they follow

Imperfect.

Seguíva or *seguía*, I was following
seguivi, thou wast following
seguiva or *seguía*, he was following
seguivámo, we were following
seguivate, you were following
seguívano or *seguíano*, they were following

Indeterminate Preterite.

Seguíi, I followed
seguísti, thou followedst
seguì or *seguío*, he followed
seguímmo, we followed
seguíste, you followed
seguírono, *seguíro*, or *seguír*, they followed

Future.

Seguirò, I shall or will follow
seguirái, thou wilt follow
seguirà, he will follow
seguirémo, we will follow
seguirête, you will follow
seguiránno, they will follow

Conditional Present.

Seguirèi or *seguiría*, I should or would follow
seguirésti, thou wouldst follow
seguirébbe or *seguiría*, he would follow
seguirémmo, we would follow
seguiríste, you would follow
seguirébbero, *seguiríano*, or *seguirísno*, they would follow

IMPERATIVE MOOD.

[No First Person.]
Ségui or *siégui*, follow (thou)
ségua or *siégua*, let him follow
seguiámo, let us follow
seguite, follow (ye or you)
séguano or *siéguano*, let them follow

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che ségua or *siégua*, that I may follow	*Che seguissi*, that I might follow
che ségua, *siégua*, *ségui*, *siégui*, that thou mayst follow	*che seguissi*, that thou mightst follow
che ségua or *siégua*, that he may follow	*che seguisse*, that he might follow
che seguiámo, that we may follow	*che seguissimo*, that we might follow
che seguiáte, that you may follow	*che seguíste*, that you might follow
che séguano or *siéguano*, that they may follow	*che seguissero*, that they might follow

So conjugate—

Conseguire, to obtain | *Perseguire*, to persecute
Inseguire, to run after | *Proseguire*, to prosecute

Udire, to hear.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *udire*, to hear	Past: *avére udito*, to have heard
Present Gerund: *udéndo*, hearing	Past Gerund: *avéndo udito*, having heard
Past Participle: *udito*, heard	

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INDICATIVE MOOD.

Present.	
O'do, I hear	*udírono*, *udíro*, or *udír*, they heard
ódi, thou hearest	
óde, he hears	Future.
udímo, we hear	*Udiré* or *udré*, I shall or will hear
udíte, you hear	*udirás* or *udrás*, thou wilt hear
ódono, they hear	*udirá* or *udrá*, he will hear
Imperfect.	*udirémo* or *udrémo*, we will hear
Udíva or *udía*, I was hearing	*udiréte* or *udréte*, you will hear
udíri, thou wast hearing	*udirándno* or *udrándno*, they will hear
udíva or *udía*, he was hearing	
udívimo, we were hearing	Conditional Present.
udívite, you were hearing	*Udirái* or *udrái*, I should or would hear
udívano or *udíano*, they were hearing	*udirésti*, thou wouldst hear
	udirébbe or *udiría*, he would hear
Indeterminate Preterite.	*udirémmo*, we would hear
Udíi, I hoard	*udiréste*, you would hear
udísti, thou heardest	*udirébbero*, they would hear
udí or *udío*, he heard	
udímma, we heard	
udíste, you heard	

IMPERATIVE MOOD.

[No First Person.]	
O'di, hear (thou)	*udídmo*, let us hear
óda, let him hear	*udíte*, hear (ye or you)
	ódano, let them hear

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che óda, that I may hear	*Che udissi*, that I might hear
che óda, that thou mayst hear	*che udissi*, that thou mightst hear
che óda, that he may hear	*che udísse*, that he might hear
che udiámo, that we may hear	*che udissimo*, that we might hear
che udiáte, that you may hear	*che udiste*, that you might hear
che ódano, that they may hear	*che udissero*, that they might hear

So conjugate—

Disudire, to feign not to hear	*Riudire*, to hear again
Fraudire, to overhear	*Traudire*, to overhear

Uscíre, to go out.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *uscíre*, to go out	Past: *éssere uscíto*, to have gone out
Present Gerund: *uscéndo*, going out	Past Gerund: *essendo uscíto*, having gone out
Past Participle: *uscíto*, gone out	

INDICATIVE MOOD.

Present.	
E'sco, I go out	*uscivámo*, we were going out
ésci, thou goest out	*uscivate*, you were going out
ésce, he goes out	*uscívano*, *usciano*, or *uscíeno*, they were going out
usciámo, we go out	
uscíte, you go out	Indeterminate Preterite.
éscono, they go out	
	Uscíi or *usci*, I went out
Imperfect.	*uscísti*, thou wentest out
Uscíva or *uscía*, I was going out	*usci* or *uscío*, he went out
uscíri, thou wast going out	*uscímma*, we went out
uscíva or *uscía*, he was going out	*uscíste*, you went out
	uscírono, *uscíro*, or *uscír*, they went out

Future.	Conditional Present.
Usciró, I shall or will go out	*Uscirái*, or *usciría*, I should or would go out
uscirái, thou wilt go out	*uscirésti*, thou wouldst go out
uscirá, he will go out	*uscirébbe*, or *usciría*, he would go out
uscirémo, we will go out	*uscirémmo*, we would go out
usciréte, you will go out	*usciréste*, you would go out
uscirándno, they will go out	*uscirébbero*, *uscirémo*, or *uscirían*, they would go out

IMPERATIVE MOOD.

[No First Person.]	
E'sci, go out (thou)	*uscídmo*, let us go out
ésca, let him go out	*uscíte*, go out (ye or you)
	éscano, let them go out

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che ésca, that I may go out	*Che uscissi*, that I might go out
che ésca, that thou mayst go out	*che uscissi*, that thou mightst go out
che ésca, that he may go out	*che uscísse*, that he might go out
che uscídmo, that we may go out	*che uscissimo*, that we might go out
che uscíate, that you may go out	*che uscíste*, that you might go out
che éscano, that they may go out	*che uscissero*, that they might go out

So conjugate—

Riuscire, to succeed.

LESSONS IN SPANISH.—No. XVI.

CONJUGATION.—*Continued.*

Oir, to hear.

Past Participle: *oído*. | Gerund: *oyendo*.

INDICATIVE MOOD.

Present.

Oigo,	
Oyes,	
Oye,	*Oyen*,

IMPERATIVE MOOD.

Oiga,	*Oigamos*,
Oye,	
Oiga,	*Oigan*,

SUBJUNCTIVE MOOD.

Present.

Oiga,	*Oigamos*,
Oigas,	*Oigais*,
Oiga,	*Oigan*,

Imperfect.

Oyera, *oyese*,	*Oyéramos*, *oyésemos*,
Oyeras, *oyeses*,	*Oyérais*, *oyéseis*,
Oyera, *oyese*,	*Oyeran*, *oyesen*,

First Future.

Oyere,	*Oyéremos*,
Oyeres,	*Oyéreis*,
Oyere,	*Oyeren*,

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Producir, to produce.

Past Participle: *producido.* | Gerund: *produciendo.*

INDICATIVE MOOD.

Present.

Produzco,	[No other Persons Irregular.]

Perfect Definite.

Produje,	*Produjimos,*
Produjiste,	*Produjisteis,*
Produjo,	*Produjeron,*

IMPERATIVE MOOD.

Produzca,	*Produzcamos,*
Produzca,	*Produzcan,*

SUBJUNCTIVE MOOD.

Present.

Produzca,	*Produzcamos,*
Produzcas,	*Produzcais,*
Produzca,	*Produzcan,*

Imperfect.

Produjera, produjese,	*Produjéramos, produjésemos,*
Produjeras, produjeses,	*Produjérais, produjeseis,*
Produjera, produjese,	*Produjeran, produjesen,*

First Future.

Produjere,	*Produjéremos,*
Produjeres,	*Produjéreis,*
Produjere,	*Produjeren,*

Salir, to go out.

Past Participle: *salido.* | Gerund: *saliendo.*

INDICATIVE MOOD.

Present.

Salgo,	[No other Persons Irregular.]

First Future.

Saldré,	*Saldremos,*
Saldrás,	*Saldréis,*
Saldrá,	*Saldrán,*

IMPERATIVE MOOD.

Salga,	*Salgamos,*
Sal,	
Salga,	*Salgan,*

SUBJUNCTIVE MOOD.

Present.

Salga,	*Salgamos,*
Salgas,	*Salgais,*
Salga,	*Salgan,*

Imperfect.

Saldria,	*Saldriamos,*
Saldrias,	*Saldriais,*
Saldria,	*Saldrian,*

Sentir, to feel.

Past Participle: *sentido.* | Gerund: *sintiendo.*

INDICATIVE MOOD.

Present.

Siento,	
Sientes,	
Siente,	*Sienten,*

Perfect Definite.

Sintió,	*Sintieron,*

IMPERATIVE MOOD.

Sienta,	*Sintamos,*
Sienta,	
Sienta,	*Sientan,*

SUBJUNCTIVE MOOD.

Present.

Sienta,	*Sintamos,*
Sientas,	*Sintáis*
Sienta,	*Sientan,*

Imperfect.

Sintiera, sintiese,	*Sintiéramos, sintiésemos,*
Sintieras, sintieses,	*Sintiérais, sintieseis,*
Sintiera, sintiese,	*Sintieran, sintiesen,*

First Future.

Sintiere,	*Sintiéremos,*
Sintieres,	*Sintiéreis,*
Sintiere,	*Sintieren,*

Servir, to serve.

Past Participle: *servido.* | Gerund: *sirviendo.*

INDICATIVE MOOD.

Present.

Sirvo,	
Sirves,	
Sirve,	*Sirven,*

Perfect Definite.

Sirvió,	*Sirvieron,*

IMPERATIVE MOOD.

Sirva,	*Sirvamos,*
Sirve,	
Sirva,	*Sirvan,*

SUBJUNCTIVE MOOD.

Present.

Sirva,	*Sirvamos,*
Sirvas,	*Sirvais,*
Sirva,	*Sirvan,*

Imperfect.

Sirviera, sirviese,	*Sirviéramos, sirviésemos,*
Sirvieras, servieses,	*Sirviérais, sirvieseis,*
Sirviera, sirviese,	*Sirvieran, sirviesen,*

First Future.

Sirviere,	*Sirviéremos,*
Sirvieres,	*Sirviéreis,*
Sirviere,	*Sirvieren,*

Venir, to come.

Past Participle: *venido.* | Gerund: *viniendo.*

INDICATIVE MOOD.

Present.

Vengo,	
Vienes,	
Viene,	*Vienen,*

Perfect Definite.

Vine,	*Vinimos,*
Viniste,	*Vinisteis,*
Vino,	*Vinieron,*

First Future.

Vendré,	*Vendremos,*
Vendrás,	*Vendréis,*
Vendrá,	*Vendrán,*

Imperative Mood.

Venga,	*Vengamos,*
Ven,	
Venga,	*Vengan,*

Subjunctive Mood.

Present.

Venga,	*Vengamos,*
Vengas,	*Vengáis,*
Venga,	*Vengan,*

Imperfect.

Viniera, vendria, viniese,	*Viniéramos, vendriamos, viniésemos,*
Vinieras, vendrias, vinieses,	*Viniérais, vendriais, vinieseis,*
Viniera, vendria, viniese,	*Vinieran, vendrian, viniesen,*

First Future.

Viniere,	*Viniéremos,*
Vinieres,	*Viniereis,*
Viniere,	*Vinieren,*

DEFECTIVE VERBS.

Defective verbs are those which are not employed in all the tenses or persons.

Soler, to be accustomed, is irregular, and seldom used except in the following tenses:—

Indicative Mood.

Present.	Imperfect.
Suelo,	*Solia,*
Sueles,	*Solias,*
Suele,	*Solia,*
Solemos,	*Soliamos,*
Soleis,	*Soliais,*
Suelen,	*Solian,*

Yacer, to lie, is not often used in any other persons than the third persons singular and plural of the present indicative, chiefly at the beginning of epitaphs.

Indicative Mood.

Present.

Yago,	
Yace,	*Yacen,*

Podrir, to rot, is seldom used except in the second person plural of the imperative, *podrid;* and the third person singular of the imperfect subjunctive, *podriria.*

When *podrir* is figuratively used in any other moods or tenses, it is to be conjugated irregularly in the same tenses and persons as *servir*, by changing the *o* of the verb-root into *u;* as, *pudriendo*, rotting.

IMPERSONAL VERBS.

Impersonal verbs (or unipersonal verbs) are those which are employed only in the third person singular, and having no subject, take *it* or *there* with them in English; as, *llueve*, it rains; *tronará*, it will thunder; *nieve*, let it snow; *hay*, there is, or there are; *habrá*, there will be.

Llover, to rain, is thus conjugated impersonally:—

Past Participle: *llovido.* | Gerund: *lloviendo.*

Indicative Mood.

Present: *llueve*, it rains.	Perfect Definite: *llovió*, it rained.
Imperfect: *llovia*, it was raining.	First Future: *llovera*, it will rain.

Imperative Mood.

Llueva, let it rain.

Subjunctive Mood.

Present: *llueva*, it may rain.	*lloviese*, it might rain.
Imperfect: *lloviera*, it would rain.	First Future: *si lloviere*, if it should rain.
llovería, it should rain.	

All the impersonal verbs are conjugated like some of the verbs whose conjugation has been already given; thus, *llover*, it will be seen, is irregular, and is conjugated like *mover* in the third person singular of each tense.

Haber and *hacer* are often used as impersonal verbs, and are, in such cases, to be rendered in English by the tenses of the verb, to be; as, *hay*, there is, or, there are; *hace*, it is.

Conjugation of *haber*, to be, as used impersonally:—

Past Participle: *habido.* | Gerund: *habiendo*, there being

Indicative Mood.

Present: *hay*, or *ha*, there is, or there are.	Perfect Definite: *hubo*, there was, or there were.
Imperfect: *habia*, there was, or there were.	First Future: *habrá*, there will be.

Imperative Mood.

Haya, let there be.

Subjunctive Mood.

Present: *haya*, there may be.	*hubiese*, there might be.
Imperfect: *hubiera*, there would be.	First Future: *si hubiere*, if there should be.
habria, there should be.	

Hay, *habia*, and *hubo* are rendered in English sometimes in the singular and sometimes in the plural, according as a singular or plural noun follows; thus, *hay una muger que tiene calenturas*, there is a woman who has a fever; *hay mugeres que no la tienen*, there are women who have it not.

Hacer, when employed impersonally, is to be rendered in English by the verb, to be; as, *hace*, it is; *hacia*, it was; *hizo*, it was; *hará*, it will be; *haga*, it may be, etc.; thus, *hace frio*, it is cold; *hace mucha aire*, there is much wind; *hace luna*, there is a moon; *hace buen tiempo*, it is good weather; *hace diez meses que ella murió*, it is ten months since she died.

Placer, to please, is used impersonally in the following tenses only:—

Indicative Mood.

Present: *place*, it pleases.	Perfect Indefinite: *plugo*, it pleased.
Imperfect: *placia*, it was pleasing	

Subjunctive Mood.

Present: *plegue*, it may please.	*pluguiese*, it might please.
Imperfect: *pluguiera*, it would please.	First Future: *si pluguiere*, if it should please.

The persons of *placer* in the subjunctive, are used only in these expressions—*plegue*, *pluguiere*, or *pluguiese á Dios;* may it, should it, or might it please God; *si me pluguiere*, if it should please me.

There are some verbs that can be used in all the persons of the tenses, and also, at times, impersonally; as, *es muy tarde*, it is very late; *es preciso*, it is necessary; *es menester*, there is necessity; *parece*, it seems; *conviene*, it suits; *basta*, it is sufficient

LIST OF IRREGULAR, DEFECTIVE, AND IMPERSONAL VERBS.

The following list contains all the irregular verbs in the Spanish language. Each verb is to be conjugated in its irregular tenses like the verb to which reference is made in the last column; that is, each one is irregular in the same tenses and persons, and in the same manner, as the verb which is opposite to it. In the tenses and persons which are not irregular, each verb is to be conjugated like the regular verb of the same conjugation; those ending in *ar* like *amar*, those in *er* like *comer*, and those in *ir* like *vivir*. The verbs marked † are impersonal, and, of course, to be used only in the third person singular of each mood and tense.

Every verb not included in this list is regular, and must be conjugated like the model verbs *amar*, *comer*, or *vivir*, according as it ends in *ar*, *er*, or *ir*.

1st Conjugation.

Acertar	*like*	tentar
Acordar	,,	contar
Acostar	,,	contar
Acrecentar	,,	tentar
Adestrar	,,	tentar
Agorar	,,	contar
Alentar	,,	tentar
Almorzar	,,	contar
Amolar	,,	contar
Andar	,,	
Apacentar	,,	tentar
Aporcar	,,	contar
Aportar	,,	contar
Apostar	,,	contar
Apretar	,,	tentar
Aprobar	,,	contar
Arrendar	,,	tentar
Asentar	,,	tentar
Aserrar	,,	tentar
Asestar	,,	tentar
Asolar	,,	contar
Asoldar	,,	contar
Asonar	,,	contar
Atestar*	,,	tentar
Atravesar	,,	tentar
Atronar	,,	contar
Aventar	,,	tentar
Avergonzarse	,,	contar

2nd Conjugation.

Abastecer	*like*	parecer
Aborrecer	,,	parecer
Absolver	,,	mover
Abstraer	,,	traer
Acaecer	,,	parecer
Acontecer	,,	parecer
Adolecer	,,	parecer
Adormecerse	,,	parecer
Agradecer	,,	parecer
Amanecer	,,	parecer
Amortecerse	,,	parecer
Anochecer	,,	parecer
Anteponer	,,	poner
Antever	,,	ver
Aparecer	,,	parecer
Apetecer	,,	parecer
Ascender	,,	tender
Atender	,,	tender
Atenerse	,,	tener
Atraer	,,	traer

3rd Conjugation.

Adherir	*like*	sentir
Adquerir	,,	sentir
Adquirir	,,	
Advertir	,,	sentir
Apercibir	,,	servir
Argüir	*like*	incluir
Arrecirse	,,	servir
Arrepentirse	,,	sentir
Asentir	,,	sentir
Asir	,,	
Aterirse	,,	sentir
Atribuir	,,	incluir
Avenirse	,,	venir

1st Conjugation.

Bregar	*like*	tentar

2nd Conjugation.

Bermejecer	*like*	parecer

3rd Conjugation.

Bendecir		

1st Conjugation.

Calentar	*like*	tentar
Cegar	,,	tentar
Cerrar	,,	tentar
Cimentar	,,	tentar
Colar	,,	contar
Colgar	,,	contar
Comenzar	,,	tentar
Comprobar	,,	contar
Concertar	,,	tentar
Concordar	,,	contar
Confesar	,,	tentar
Consolar	,,	contar
Consonar	,,	contar
Constar†	,,	amar
Contar		
Costar	,,	contar

2nd Conjugation.

Caber	*like*	
Caer	,,	
Caneeer	,,	parecer
Carecer	,,	parecer
Cerner	,,	tender
Cocer	,,	mover
Compadecerse	,,	parecer
Comparecer	,,	parecer
Complacer	,,	parecer
Componer	,,	poner
Condescender	,,	tender
Condoler	,,	mover
Conmover	,,	mover
Conocer	,,	parecer
Contender	,,	tender
Contener	,,	tener
Contraer	,,	traer
Contrabacer	,,	hacer
Convalecer	,,	parecer
Crecer	,,	parecer

3rd Conjugation.

Ceñir	*like*	servir
Colegir	,,	servir
Comedirse	,,	servir
Competir	,,	servir
Concebir	,,	servir
Concernir†	,,	vivir
Concluir	,,	incluir
Conducir	,,	producir
Conferir	,,	sentir
Conseguir	,,	servir
Consentir	,,	sentir
Constituir	,,	incluir
Constreñir	,,	servir
Construir	,,	incluir
Contradecir	,,	decir
Contravenir	,,	venir
Contribuir	,,	incluir
Controvertir	,,	sentir
Corregir	,,	servir

1st Conjugation.

Dar	*like*	
Decentar	,,	tentar
Decimentar	,,	tentar
Degollar	,,	contar
Demostrar	,,	contar
Denegar	,,	tentar
Denostar	,,	contar
Derrengar	,,	tentar
Desacertar	,,	tentar
Desacordar	,,	contar
Desalentar	,,	tentar
Desapretar	,,	tentar
Desaprobar	,,	contar
Desasosegar	,,	tentar
Desatentar	,,	tentar
Descolgar	,,	contar
Descollar	,,	conter
Desconcertar	,,	tentar
Desconsolar	,,	contar
Descontar	,,	contar
Descmpedrar	,,	tentar
Desencerrar	,,	tentar
Desengrosar	,,	contar
Desenterrar	,,	tentar
Desflocar	,,	contar
Desforgarse	,,	contar
Deshelar	,,	tentar
Desherrar	,,	tentar
Desmembrar	,,	tentar
Desolar	,,	contar
Desollar	,,	contar
Desovar	,,	contar
Despedrar	,,	tentar
Despernar	,,	tentar
Despertar	,,	tentar
Desplegar	,,	tentar
Despoblar	,,	contar
Desterrar	,,	tentar
Destrocar	,,	contar
Desvergonaarse	,,	contar
Dezmar	,,	tentar

2nd Conjugation.

Decaer	*like*	caer
Defender	,,	tender
Demoler	,,	mover
Deponer	,,	poner
Desabastecer	,,	parecer
Desadormecer	,,	parecer
Desaparecer	,,	parecer
Desatender	,,	tender
Desstraer	,,	traer
Descaecer	,,	parecer
Descender	,,	tender
Descomponer	,,	poner
Desconocer	,,	parecer
Desentenderse	*like*	tender
Desentorpecer	,,	parecer
Desenvolver	,,	mover
Desfallecer	,,	parecer
Desflaqueeerse	,,	parecer
Desguarnecer	,,	parecer
Deshaeer	,,	hacer
Desobedecer	,,	parecer
Desplacer	,,	parecer
Destorcer	,,	mover
Desvanecerse	,,	parecer
Detener	,,	tener
Detraer	,,	traer
Devolver	,,	mover
Disolver	,,	mover
Disponer	,,	poner
Distraer	,,	traer
Doler	,,	mover

3rd Conjugation.

Decir	*like*	
Dedneir	,,	producir
Deferir	,,	sentir
Derretir	,,	servir
Desaveoir	,,	venir
Desceñir	,,	servir
Descomedirse	,,	servir
Desconsentir	,,	sentir
Desdecirse	,,	decir
Deservir	,,	servir
Desleir	,,	servir
Deslucir	,,	lucir
Desmentir	,,	sentir
Despedir	,,	servir
Desteñir	,,	servir
Destruir	,,	incluir
Diferir	,,	sentir
Digerir	,,	sentir
Disminuir	,,	incluir
Distribuir	,,	incluir
Diverter	,,	sentir
Dormir	,,	

1st Conjugation.

Emendar	*like*	tentar
Empedrar	,,	tentar
Empesar	,,	tentar
Emporcar	,,	contar
Encenaar	,,	tentar
Encerrar	,,	tentar
Encomender	,,	tentar
Encontrar	,,	contar
Encordar	,,	contar
Encubertar	,,	tentar
Engrosar	,,	contar
Enrodar	,,	contar
Ensangrentar	,,	tentar
Enterrar	,,	tentar
Errar	,,	
Escalentar†	,,	tentar
Escarehar	,,	amar
Escarmentar	,,	tentar
Esforzarse	,,	contar
Espresar	,,	tantar
Estar	,,	
Estercolar	,,	contar
Estregar	,,	tentar

2nd Conjugation.

Embebecerse	*like*	parecer
Embravecerse	,,	parecer
Embruteeerse	,,	parecer
Emplumecer	,,	parecer
Empobrecer	,,	parecer
Enеabellecer	,,	parecer
Enealvecer	,,	parecer
Encallecer	,,	parecer
Encanecer	,,	parecer
Encarecer	,,	parecer

* When *atestar* means to fill, to cram, it is irregular; when it means to attest, it is regular.

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Encrndrr *like* tender
Encruderersa „ parrecer
Enrruelecer „ parrrer
Endentecrr „ parerrr
Endurecer „ parecer
Enflaquecer „ parecrr
Enfurecersa „ parecrr
Engrandecer „ parrrer
Enloquecer „ parerer
Enmocecer „ parerer
Enmohrcersa „ parerrr
Enmudrcer „ parecer
Ennegrerer „ parerrr
Ennoblecer „ parecer
Enrarecer „ paracrr
Enriqurrrr „ parecar
Ensoberbercrse „ parecer
Entallecrr „ parecer
Entender „ tender
Enternecer „ parecer
Entomrrer „ parecer
Entontecerse „ parecer
Entorpererse „ parecer
Entretener „ tener
Entristecersa „ parrerr
Entullerer „ parecrr
Entumerer „ parrecr
Envejecer „ parecer
Enverdreer „ parecer
Envolver „ mover
Equivaler „ valer
Escarnecer „ parecer
Esrlarercr „ parrcer
Esocer „ movrr
Espavorecer „ parecer
Esponrr „ poner
Establecer „ parecer
Estender „ tendrr
Estrarr „ trarr
Estremecerse „ parecer

3rd Conjugation.

Elegir *like* servir
Embestir „ servir
Engreirsa „ servir
Enlucir „ lucir
Entrelurir „ lurir
Entreoir „ oir
Envestir „ sentir
Erguir „
Estreñir „ servir
Excluir „ inrluir
Esprdir „ arrvir

1st Conjugation.

Forzar *like* contar
Fregar „ tentar
Frrzar „ tentar

2nd Conjugation.

Fallecer *like* parerrr
Favorecer „ parecer
Fenrrer „ parecer
Fortalrcer „ parecer

3rd Conjugation.

Fluir *like* incluir
Frrir „ servir

1st Conjugation.

Gobernar *like* tentar
Granizar§ „ amar

2nd Conjugation.

Guarnecer *like* parecer

3rd Conjugation.

Gemir *like* servir

1st Conjugation.

Hrlar *like* tentar
Herrar *like* tentar
Holgar „ rontar
Hollar „ contar

2nd Conjugation.

Habrr *like*
Hacer „
Hrder „ tender
Hrnder „ tender
Humrdecer „ parrrrr

3rd Conjugation.

Herir *like* sentir
Hrrvir „ srntir
Huir „ incluir

1st Conjugation.

Importar§ *like* amar
Infernar „
Insertar „ tentar
Invernar „ tentar

2nd Conjugation.

Imponer *like* poner
Indisponrr „ ponrr

3rd Conjugation.

Imbuir *like* incluir
Impedir „ serrir
Inadvertir „ sentir
Inrluir „
Inducir „ producir
Inferir „ sentir
Ingerir „ sentir
Instituir „ incluir
Instruir „ incluir
Intervenir „ venir
Introducir „ producir
Invertir „ srntir
Investir „ sentir
Ir „

1st Conjugation.

Jugar

3rd Conjugation.

Lnrir *like* lurir
Lnir „ incluir

1st Conjugation.

Llovinaar§ *like* amar

2nd Conjugation.

Llover§

1st Conjugation.

Manifestar *like* trntar
Mentar „ tentar
Merendar „ tentar
Mostrar „ contar

2nd Conjugation.

Magrrrrr *like* parerer
Mantener „ tener
Meter „ parecer
Merecrr „ parecrr
Moheccrso „ parecer
Moler „ mover
Mollecer „ parecrr
Morder „ mover
Movrr „

3rd Conjugation.

Maldecir *like* bendecir
Medir „ servir
Mentir „ sentir
Morir „ dormir
Muir „ incluir

1st Conjugation.

Negar
Nevar §

2nd Conjugation.

Nacer *like* parecrr
Negrecer „ parecer

2nd Conjugation.

Obedecer *like* parrrrr
Obscurecer „ parecer
Obtenrr „ trner
Ofrecer „ parecrr
Olrr „
Oponer „ poner

3rd Conjugation.

Ob truir *like* incluir
Oir „

1st Conjugation.

Pensar *like* tentar
Perniquebrar „ trntar
Plegar „ tentar
Poblar „ contar
Probar „ contar

2nd Conjugation.

Pacer *like* parecer
Padecer „ parecer
Parecer „
Perder „ tendrr
Perecer „ parecer
Pertenecer, „ parecer
Placer „
Poder „
Ponrr „
Preponrr „ poner
Presuponrr „ ponrr
Prevalrcer „ parecer
Prevec „ ver
Promover „ movrr
Proponer „ poner

3rd Conjugation.

Pedir *like* servir
Perseguir „ servir
Pervertir „ sentir
Podrir „
Prrdecir „ decir
Preferir „ sentir
Prrsrntir „ sentir
Prrvenir „ venir
Producir „
Proferir „ srntir
Proseguir „ srrvir
Prostituir „ inrluir
Provrnir „ vrnir

1st Conjugation.

Quebrar *like* tentar

2nd Conjugation.

Querer

1st Conjugation.

Recomendar *like* tantar
Recordar „ contar
Recostar „ contar
Reforzar „ contar
Regar „ trntar
Regoldar „ contar
Relampaguear§ „ amar
Remendar „ trntar
Renegar „ tentar
Renovar „ rontar
Replegar „ tantar
Reprobar „ contar
Requebrar „ tentar
Resrontrar „ contar
Resollar „ contar
Resonar „ contar
Rrtemblar „ tentar
Rrtentar „ tentar
Revrntar „ tentar
Revolar *like* contar
Revolcarse „ contar
Rodar „ contar
Rogar „ contar

2nd Conjugation.

Recarr *like* caer
Recocer „ movrr
Reconocer „ parecer
Reconvalecer „ parecrr
Recrrrer „ parecer
Reflorecer „ parecer
Rehacrr „ hacer
Remanerer „ parecer
Remecer „ parecer
Remorder „ mover
Removrr „ mover
Renarer „ parecer
Reponer „ ponrr
Resolvrr „ movrr
Restablecer „ parecer
Retener „ tener
Retorcer „ mover
Retraer „ traer
Retrotraer „ traer
Revrr „ ver
Revrrderer „ parecer
Raverter „ tendrr
Revolver „ mover

3rd Conjugation.

Recluir *like* inrlnir
Reducir „ prodncir
Referir „ sentir
Regir „ servir
Reir „ srrvir
Relurir „ lucir
Rendir „ servir
Reñir „ srrvir
Repetir „ servir
Requerir „ sentir
Resrntirse „ srntir
Restituir „ inrluir
Retreñir „ servir
Retribuir „ incluir
Revenir „ venir
Revestir „ servir

1st Conjugation.

Segar *like* tentar
Sembrar „ trntar
Sentarse „ trntar
Serrar „ tentar
Solar „ rontar
Soldar „ contar
Soltar „ contar
Sonar „ rontar
Soñar „ contar
Sosegarse „ trntar
Soterrar „ trntar

2nd Conjugation.

Saber *like*
Satisfacrr „ hacer
Ser „
Sobreponer „ poner
Soler „
Solvrr „ mover
Sostener „ tener
Sustrarr „ traer
Suponer „ ponrr

3rd Conjugation.

Salir *like*
Sedurir „ producir
Srguir „ srrvir
Srntir „
Servir „
Sobresalir „ salir
Sobrevenir „ venir

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Sonreirse	,,	servir
Sustituir	,,	incluir
Sugerir	,,	acentir

1st Conjugation.

Temblar	*like*	tentar
Tentar	,,	
Tostar	,,	contar
Trascolar	,,	contar
Trascordarse	,,	contar
Trasegar	,,	tentar
Trasoñar	,,	contar
Trocar	,,	contar
Tronar	,,	contar
Tropezar	,,	tentar

2nd Conjugation.

Tender	*like*	
Tenar	,,	
Torcer	,,	mover
Traer	,,	
Trascender	,,	tender
Trasponer	,,	poner

3rd Conjugation.

Teñir	*like*	servir
Traducir	,,	producir

1st Conjugation.

Volar	*like*	contar
Volcar	,,	contar

2nd Conjugation.

Valer	*like*	
Ver	,,	
Verter	,,	tender
Volver	,,	morer

3rd Conjugation.

Venir	*like*	
Vestir	,,	servir

2nd Conjugation.

Yacer		

3rd Conjugation.

Zaherir	*like*	sentir

THEORY AND PRACTICE OF TEACHING.

No. II.

PERSONAL HABITS OF THE TEACHER.

The importance of correct habits to any individual cannot be overrated. The influence of the teacher is so great upon the children under his care, either for good or evil, that it is of the utmost importance to them as well as to himself that his habits should be unexceptionable. It is the teacher's sphere to *improve* the community in which he moves, not only in learning, but in morals and manners; *in every thing* that is "lovely and of good report." This he may do partly by precept, but very much by example. *He teaches, wherever he is.* His manners, his appearance, his character, are all the subject of observation, and to a great extent of imitation, by the young in his district. He is observed not only in the school, but in the family, in the social gathering, and in the religious meeting. How desirable then that he should be a *model* in all things!

Man has been said to be a "bundle of habits;" and it has been as pithily remarked—"Happy is the man whose habits are his friends." It were well if all persons, before they become teachers, would attend carefully to the formation of their personal habits. This, unhappily, is not always done, and therefore we shall make no apology for introducing in this place some very plain remarks on what we deem the essentials among the habits of the teacher.

1. Neatness. This implies cleanliness of the person. If some who assume to teach were not proverbial for their slovenliness, we would not dwell on this point. On this point, however, we must be allowed great plainness of speech, even at the expense of incurring the charge of excessive nicety; for it is by attending to a *few little things* that one becomes a strictly neat person. The morning ablution, then, should never be omitted, and the comb for the hair and brush for the clothes should always be called into requisition before the teacher presents himself to the family or to his school. Every teacher would very much promote his own health by washing the whole surface of the body every morning in cold water. This is now done by very many of the most enlightened teachers, as well as others. When physiology is better understood, this practice will be far more general. To no class of persons is it more essential than to the teacher; for on account of his confinement, often in an unventilated room, with half a hundred children during the day, very much more is demanded of the exhalents in him than in others. His only safety is in a healthy action of the skin.

The *teeth* should be attended to. A brush and clean water have saved many a set of teeth. It is bad enough to witness the deplorable neglect of these important organs so prevalent in the community; but it is extremely mortifying to see a filthy set of teeth in the mouth of the teacher of our youth. The *nails*, too, I am sorry to say, are often neglected by some of our teachers, till their *ebony tips* are anything but ornamental. This matter is made worse, when, in the presence of the family or of the school, the penknife is brought into requisition to remove that which should have received attention at the time of washing in the morning. The *teacher* should remember that it is a *vulgar* habit to pare or clean the nails while in the presence of others, and especially during conversation with them.

The teacher should be neat in his *dress*. We do not urge that his dress should be expensive. His income ordinarily will not admit of this. He may wear a very plain dress; nor should it be any way singular in its fashion. All we ask is, that his clothing should be in good taste, and *always clean*. A slovenly dress, covered with dust, or spotted with grease, is never so much out of its proper place as when it clothes the teacher.

While upon this subject we may be indulged in a word or two upon the use of tobacco by the teacher. It is quite a puzzle to us to tell why any man but a Turk, who may lawfully dream away half his existence over the fumes of this filthy narcotic, should ever use it. Even if there were nothing wrong in the use of unnatural stimulants themselves, the filthiness of tobacco is enough to condemn it among teachers, especially in the form of chewing. It is certainly worth while to ask whether there is not some moral delinquency in teaching this practice to the young, while it is admitted, by nearly all who have fallen into the habit, to be an evil, and one from which they would desire to be delivered. At any rate, I hope the time is coming, when the good taste of teachers, and a regard for personal neatness and the comfort of others, shall present motives sufficiently strong to induce them to break away from a practice at once so unreasonable and so disgusting.

2. Order. In this place we refer to that *system* and regularity so desirable in every teacher. He should practise it in his room at his boarding-house. Every thing should have its place. His books, his clothing, should all be arranged with regard to this principle. The same habit should go with him to the school-room. His desk there should be a pattern of orderly arrangement. Practising this himself, he may with propriety insist upon it in his pupils. It is of great moment to the teacher, that, when he demands order and arrangement among his pupils, they cannot appeal to any breach of it in his own practice.

3. Courtesy. The teacher should ever be courteous, both in his language and in his manners. *Courtesy of language* may imply a freedom from all *coarseness*. There is a kind of communication, used among boatmen and hangers-on at bar-rooms, which should find no place in the teacher's vocabulary. All vulgar jesting, all double-entendres, all low allusions, should be for ever excluded from his mouth. And profanity—can it be necessary that we should speak of this as among the habits of the teacher? Yes, it is even so. Such is the want of moral sense in the community, that men are still employed in some districts whose ordinary conversation is poisoned with the breath of blasphemy; ay, and even the walls of the school-room resound to undisguised oaths! We cannot find words to express our astonishment at the indifference of parents, or at the recklessness of teachers, wherever we know such cases to exist.

Speaking of the *language* of the teacher, we might urge also that it should be both *pure* and *accurate*. Pure as distinguished from all those cant phrases and provincialisms which amuse the vulgar in certain localities; and accurate as to the terms used to express his meaning. As the *teacher teaches* in this, as in every thing, by example as well as by precept, he should be very careful to acquire an unexceptionable use of our language, and never deviate from it in the hearing of his pupils or elsewhere.

There is a *courtesy of manner*, also, which should characterise the teacher. This is not that ridiculous obsequiousness which some persons assume, when they would gain the good opinion of others. It is true politeness; by politeness we do not mean any particular form of words, nor any prescribed or prescribable mode of action. It does not consist in *bowing* according to any approved plan, nor in a compliance simply with the formulas of etiquette in the fashionable world. True politeness is founded in benevolence. Its law is embodied in the golden rule of the Saviour:—"Whatsoever ye would that men

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should do to you, do ye even so unto them." It is the exercise of real kindness. It entertains a just regard for the feelings of others, and seeks to do for them what would make them really happy.

The teacher should possess this quality. Whenever he meets a child, it should be with the looks and words of kindness. Whenever he receives any token of regard from a pupil, he should acknowledge it in the true spirit of politeness. Whenever he meets a pupil in the street, or in a public place, he should cordially recognise him. In this way, and a thousand others, which, if he have the right spirit, will cost him nothing, he will cultivate true courtesy in his pupils. He can do it in this way more effectually than he can by formally lecturing upon the subject. True politeness will always win its true reciprocation. Two teachers were once walking together in the streets of a large town in England. Several lads whom they met on the side-walk, raised their caps as they exchanged the common salutations with one of the teachers. "What boys are these that pay you such attention as they pass?" inquired the other. "They are my scholars," answered his friend. "Your scholars! Why how do you teach them to be so very polite? Mine are pretty sure never to look at me; and generally they take care to be on the other side of the street." "I am unable to tell," said his friend; "I never say any thing about it. I usually bow to them, and they are as ready to bow to me." The whole secret consisted in this teacher's meeting his pupils in the spirit of kindness.

We would not, however, discourage a teacher from actually inculcating good manners by precept. It should indeed be done. The manners of pupils are too much neglected in most of our schools, and, we are sorry to say, in most of our families. Our youth are growing up with all the independence of sturdy young republicans,—and they sometimes show a want of respect for their seniors or superiors which is quite mortifying to all lovers of propriety. It is the teacher's province to counteract this; and in order to do it well, he should possess the virtue of true courtesy, both in theory and practice.

4. PUNCTUALITY. This, as a *habit*, is essential to the teacher. He should be punctual in every thing. He should always be present at or before the time for opening the school. A teacher who goes late to school once a week, or even once a month, cannot very well enforce the punctual attendance of his pupils. We once knew a man who for seven long years was never late at school a single minute, and seldom did he fail to reach his place more than five minutes before the time. We never knew but one such. We have known scores who were frequently tardy, and sometimes by the *space of a whole hour!*

A teacher should be as punctual in dismissing as in opening his school. We know that some make a virtue of keeping their schools beyond the regular hours. We have always considered this a very questionable virtue. If a teacher wishes to stay beyond his time, it should be either with delinquents, who have some lessons to make up, or with those who voluntarily remain. But, after all, if he has been strictly punctual to the hours assigned for his various duties in school, there will scarcely be the necessity for him, or any of his pupils, to remain beyond the time for dismission; and, as a general rule, a regard both for his own health and theirs should forbid this. It is better to work diligently while one does work, and not to protract the time of labour, so as to destroy one's energy for to-morrow.

This habit of punctuality should run through everything. He should be punctual at all engagements; he should be studiously so in all the detail of school exercises; he should be so at his meals, at his private studies, at his hour of retiring at night and of rising in the morning, and also at his exercise and recreation. This is necessary to a truly exemplary character, and it is equally as necessary to good health.

5. HABITS OF STUDY. Unless the teacher takes care to furnish his own mind, he will soon find his present stock of knowledge, however liberal that may be, fading from his memory and becoming unavailable. To prevent this, and to keep along with every improvement, he should regularly pursue a course of study. We say *regularly*; for in order to accomplish any thing really desirable, he must do something every day. By strict system in all his arrangements, he may find time to do it; and whenever we are told by a teacher that he *cannot find time* to study, we always infer that there is a want of order in his arrangements, or a want of punctuality in the observance of that order. Human life, indeed, is short; but most men still further abridge the period allotted to them by a disregard of system.

LESSONS IN READING AND ELOCUTION.

No. XXVII.

THE LYRE.

There was a lyre, 'tis said, that hung
 High waving in the summer air;
An angel's hand its chords had strung,
 And left to breathe its music there.
Each wandering breeze, that o'er it flew,
 Awoke a wilder, sweeter strain,
Than ever shell of mermaid blew
 In coral grottoes or the main.
When springing from the rose's bell,
 Where all night he had sweetly slept,
The zephyr left the flowery dell,
 Bright with tears that morning wept,
He rose, and o'er the trembling lyre,
 Waved lightly his soft azure wing;
What touch such music could inspire!
 What harp such lays of joy could sing!
The murmure of the shaded rills,
 The birds, that sweetly warbled by,
And the soft echo from the hills,
 Were heard not where that harp was nigh.
When the last light of fading day
 Along the bosom of the west,
In colours softly mingled lay,
 While night had darkened all the rest,
Then softer than the fading light,
 And sweeter than the lay that rung
Wild through the silence of the night,
 As solemn Philomela sung,
That harp its plaintive murmurs sighed
 Along the dewy breeze of even;
So clear and soft they swelled and died,
 They seemed the echoed songs of heaven.
Sometimes when all the air was still,
 And not the poplar's foliage trembled,
That harp was nightly heard to thrill
 With tones no earthly tones resembled.
And then upon the moon's pale beams
 Unearthly forms were seen to stray,
Whose starry pinions' trembling gleams
 Would oft around the wild harp play.
But soon the bloom of summer fled,—
 In earth and air it shone no more;
Each flower and leaf fell pale and dead,
 While skies their wintry sternness wore.
One day loud blew the northern blast,
 The tempest's fury raged along.
Oh! for some angel, as they passed,
 To shield the harp of heavenly song!
It shrieked,—how could it bear the touch,
 The cold rude touch of such a storm,
When e'en the zephyr seemed too much
 Sometimes, though always light and warm!
It loudly shrieked,—but ah! in vain;—
 The savage wind more fiercely blew;
Once more,—it never shrieked again,
 For every chord was torn in two.
It never thrilled with anguish more,
 Though beaten by the wildest blast;
The pang that thus its bosom tore
 Was dreadful,—but it was the last.
And though the smiles of summer played
 Gently upon its shattered form,
And the light zephyrs o'er it strayed,
 That lyre they could not wake or warm.

Milton Ward.

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EDMUND BURKE.

A sagacious critic has advanced the opinion, that the merit of Burke was almost wholly literary; but I confess I see little ground for this assertion, if literary excellence is here understood in any other sense, than as an immediate result of the highest intellectual and moral endowments. Such compositions as the writings of Burke suppose, no doubt, the fine taste, the command of language, and the finished education, which are all supposed by every description of literary success. But in the present state of society, these qualities are far from being uncommon; and are possessed by thousands, who make no pretensions to the eminence of Burke, in the same degree in which they were by him. Such a writer as Cumberland, for example, who stands infinitely below Burke on the scale of intellect, may yet be regarded as his equal or superior in purely literary accomplishments, taken in this exclusive sense.

The style of Burke is undoubtedly one of the most splendid forms in which the English language has ever been exhibited. It displays the happy and difficult union of all the richness and magnificence that good taste admits, with a perfectly easy construction. In Burke we see the manly movement of a well-bred gentleman; in Johnson, an equally profound and vigorous thinker, the measured march of a grenadier. We forgive the great moralist his stiff and cumbrous phrases, in return for the rich stores of thought and poetry which they conceal; but we admire in Burke, as in a fine antique statue, the grace with which the large flowing robe adapts itself to the majestic dignity of the person.

But with all his literary excellence, the peculiar merits of this great man were, perhaps, the faculty of profound and philosophical thought, and the moral courage which led him to disregard personal inconvenience in the expression of his sentiment. Deep thought is the informing soul, that everywhere sustains and inspires the imposing grandeur of his eloquence. Even in the Essay on the Sublime and Beautiful, the only work of pure literature which he attempted, that is, the only one which was not an immediate expression of his views on public affairs, there is still the same richness of thought, the same basis of "divine philosophy," to support the harmonious superstructure of the language. And the moral courage which formed so remarkable a feature in his character, contributed not less essentially to his literary success.

It seems to be a law of nature, that the highest degree of eloquence demands the union of the noblest qualities of character, as well as intellect. To think, is the highest exercise of the mind; to say what you think, the boldest effort of moral courage; and both these things are required for a really powerful writer. Eloquence without thoughts, is a mere parade of words; and no man can express with spirit and vigour any thoughts but his own. This was the secret of the eloquence of Rousseau, which is not without a certain analogy in its forms to that of Burke. The principal of the Jesuits' college one day enquired of him by what art he had been able to write so well. "*I said what I thought*," replied the unceremonious Genevan; conveying in these few words the bitterest satire on the system of the Jesuits, and the best explanation of his own.—*A. H. Everett.*

TRUTH.

O holy and eternal truth! Thou art
 An emanation of the Eternal Mind!
A glorious attribute,—a noble part
 Of uncreated being! Who can find,
By diligent searching who can find thee,
The Incomprehensible,—the Deity!

The human mind is a reflection caught
 From thee, a trembling shadow of thy ray.
Thy glory beams around us, but the thought
 That heavenward wings its daring flight away,
Returns to where its flight was first begun,
Blinded and beneath the noon-day sun.

The soul of man, though sighing after thee,
 Hath never known thee, saving as it knows
The stars of heaven, whose glorious light we see—
 The sun, whose radiance dazzles as it glows;
Something, that is beyond us, and above
The reach of human power, though not of human love.

Vainly Philosophy may strive to teach
 The secret of thy being. Its faint ray
Misguides our steps. Beyond the utmost reach
 Of its untiring wing, the eternal day
Of truth is shining on the longing eye,
Distant,—unchanged,—changeless, pure and high!

And yet thou hast not left thyself without
 A revelation. All we feel and see
Within us and around, forbids the doubt,
 Yet speaks so darkly and mysteriously
Of what we are and shall be evermore,
We doubt and yet believe, and tremble and adore.—
H. W. Longfellow.

CHRONOLOGY.—No. X.

A.D.
1707.—Marlborough wins the battle of Oudenarde.
1708.—Minorca taken from the Spaniards.
1709.—Sacheverell riots in London.
Charles XII. of Sweden defeated at Pultowa by Peter the Czar of Muscovy.
Marlborough wins the battle of Malplaquet.
1710.—St. Paul's Cathedral completed.
1711.—Incorporation of the South Sea Company.
1713.—Peace of Utrecht, whereby Newfoundland, Nova Scotia, New Britain, and the Hudson's Bay territory in North America were yielded to the British.
1714.—Bishop Burnet died.
Accession of George, Elector of Hanover, to the throne of Great Britain.
1715.—Battle of Dumblain.
Death of Louis XIV.
Battle of Preston.
An Act passed for Seven Year Parliaments.
1717.—Battle of Belgrade.
1718.—Charles XII. of Sweden killed.
1719.—Joseph Addison died.
1720.—Bursting of the South Sea bubble.
1725.—Accession, on the death of Peter the Great, of Catherine I., Empress of Russia.
1727.—Sir Isaac Newton died.
Inoculation first tried on criminals.
1730.—Earthquake at Pekin, in which 100,000 persons perished.
1732.—Persian throne usurped by Kouli Khan.
1739.—The first Methodist Society founded in London by John Wesley.
Kouli Khan invaded India, conquered the Mogul, and captured Delhi.
1740.—Peace of Aix-la-Chapelle.
Insurrection of the Chinese against the Dutch in Batavia.
Empress of Russia died.
Maria Theresa, daughter of the Emperor of Germany, proclaimed Queen of Hungary.
1741.—Elector of Bavaria declared war against the Queen of Hungary.
War declared against Russia by the Swedes.
Kouli Khan invaded Turkey.
Prague taken by assault.
Rollin, the historian, died.
1742.—Cession of territory made by the Hungarians to the Poles.
1743.—Defeat and retreat of Kouli Khan.
Battle of Dettingen.
1744.—Anson returns from his voyage loaded with treasure.
War between Hungary and France.
1745.—Battle of Fontenoy.
Invasion of Scotland by Charles, the Young Pretender, who took possession of Perth, Dundee, Edinburgh, &c., from whence he marched with a numerous army into England.
1746.—Battle of Culloden, and defeat of the Young Pretender.
Lima, the capital of Peru, destroyed by an earthquake.
1747.—Kouli Khan murdered.
1748.—Dr. Isaac Watts died.
1749.—British herring fishery incorporated.
1752.—The new style of calendar introduced into Great Britain, the 3rd of September being counted as the 14th.
1753.—British Museum established at Montague House.
1754.—Osman, Sultan of Turkey, ascended the throne.
1755.—Lisbon destroyed by an earthquake.
1756.—Seven years' war begun—France, Austria, and Russia against Prussia.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXXII.

(*Continued from page* 291.)

DYNAMICAL ELECTRICITY.

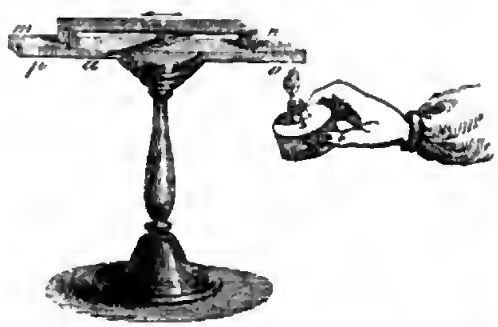
THERMO-ELECTRICAL CURRENTS.

Seebeck's Experiment.—The development of electrical currents by chemical action has occupied much of our attention, both on account of the interest attaching to it as a theory and the important practical uses to which it has been applied. But though chemical action is the most powerful source of dynamical electricity, it is not the only one. Heat is also capable of giving rise to electrical currents, which, though feeble, are interesting on account of the remarkable relation which they establish between heat and electricity, and the application to which they have been subjected in the apparatus of M. Melloni. These currents have received the name of *thermo-electrical currents*, to distinguish them from the currents produced by chemical action, and called *hydro-electrical currents*.

It had been long known that several crystals, such as tourmaline and topaz, acquired electrical properties on being subjected to a rise of temperature, and Volta had shown that a plate of silver warmed unequally at its extremities formed an electro-motive power; but Professor Seebeck, of Berlin, in 1821, first showed that the motion of heat in a metallic circuit was capable of giving rise to electrical currents.

These currents were established by means of a small apparatus represented in fig. 475, which consists of a copper plate

Fig. 475.



m n, bent at the ends, and soldered to a plate of bismuth *e p*. Inside the circuit thus formed is a magnetised needle *a*, moveable on a pivot. The apparatus being placed in the direction of the magnetic meridian, gently heat one of the soldered junctions, as represented in the figure, and the needle will then be seen to be deflected in such a way as to indicate the production of a current from *n* towards *m*, that is to say, from the warm to the cold soldered junction in the copper. If, instead of warming the soldered junction *n*, you cool it by putting ice upon it, still retaining the temperature of the other junction, a current will again be produced, but inverse to the former, that is, from *m* towards *n*, and in both cases the power of the current is directly proportional to the magnitude of the difference between the temperatures of the two extremities.

Cause of Thermo-Electrical Currents.—Therme-electrical currents cannot be attributed to contact, for they are developed in circuits formed of a single metal. Nor do they arise from chemical action, since M. Becquerel has shown that they are equally well produced in vacuo and in hydrogen. By observing currents with the aid of the galvanometer, this distinguished philosopher found that they always depend on the unequal propagation of heat along different parts of the circuit.

To prove this, take an arc formed of two metals, and join the two ends with those of the galvanometric wire, either by soldering them together, or simply by contact.

As long as the parts of the circuit so formed are at the same temperature, the galvanometer gives no indication of any current; but if one of the joinings is heated, the deflection of the needle of the multiplier immediately indicates the passing of a current.

If all parts of the circuit are homogeneous, no current is indicated when either of the extremities is heated, because then the heat is propagated equally in all directions. This takes place, for example, when the two ends of the copper wire, which is rolled round the galvanometer, are joined with a second wire of the same material. But if the homogeneity of this latter wire is destroyed at one of its points, by twisting it several times about itself, or tying it in a knot, and if it be then heated near this point, the needle will be deflected, and thus indicate the passing of a current from the point that is heated to the point where the homogeneity has been destroyed. On heating a point on the other side of this latter point, a current will be produced in the opposite direction.

Thermo-Electrical Power of Metals.—The *thermo-electrical power* of a metal is the force of the current produced by the propagation of heat in this metal. For the same differences of temperature between two neighbouring points, this power varies in different metals, and in the same metal it increases with the difference of temperature.

By forming circuits of different metals, one soldered junction of which was raised to sixty-eight degrees, while the others were at freezing point, M. Becquerel was enabled to arrange the metals in a series, according to their increasing thermo-electrical powers, as follows: bismuth, platinum, silver, tin, lead, copper, gold, zinc, iron and antimony, each being positive with those that precede it, and negative with those that follow it.

Theory of Thermo-Electrical Currents.—To explain the production of currents by the action of heat, M. Becquerel contends that when a metallic circuit is heated in one of its parts, the natural fluid is decomposed in such a manner that at the moment when the molecules are heated, they attract the positive electricity and repel the negative. Then the next molecules, being heated in their turn, are electrised positively on giving up their negative electricity to the former, and so on continually, as the heat is diffused throughout the circuit; the consequence of which is, that a current of positive electricity from the warm to the cold part is produced, and a current of negative electricity in the contrary direction.

Now, in a homogeneous circuit, as the heat is diffused equally in all directions, the heated part gives rise to two contrary currents of the same intensity, the effect of which upon the needle of the galvanometer is nothing. But if the circuit ceases to be homogeneous, the calorific conductibility being no longer the same, and the circuit being heated more in one direction than in another, two inverse currents of unequal intensity are produced, so that the force of the observed current is then the difference of those of the two currents. The intensity of the current obtained is therefore proportional to the magnitude of the difference between the thermo-electrical powers of the two metals. With regard to the direction of this current, it follows, from the above theory, that the positive pole corresponds to the metal which has the greater thermo-electrical power, and the negative pole to the other.

Properties of Thermo-Electrical Currents.—Thermo-electrical currents are distinguished from hydro-electrical currents by the peculiarity, that while they are, like them, conducted by metals, they are not conducted by liquids, or at least only in a very slight degree. This difference, however, is not owing to the nature of thermo-electrical currents, but only to their tension, which is much feebler than that of hydro-electrical currents. In fact, M. Pouillet has proved, by means of the differential galvanometer, that the intensity of the thermo-electrical current developed by a bismuth and antimony couple, the soldered junctions of which are maintained at a difference of temperature of one hundred and eighty degrees, is a thousand times less than that of the hydro-electrical current from an ordinary trough battery of twelve couples.

Thermo-electrical currents not being conducted by liquids, in consequence of their feeble tension, generally produce no chemical effect. However, M. Botto, of Turin, by combining one hundred and fifty thermo-electrical couples of platinum and iron, was enabled to obtain traces of decomposition in liquids

Thermo-electrical currents, like hydro-electrical currents, exercise a directive influence upon a magnetised needle; but as, on account of their feeble tension, they become rapidly

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weaker when the length of the circuit they traverse is increased, it is necessary to avoid the use of long wires un passing them through the circuit of the galvanometer. For this reason, in such cases the circuit is formed with a short thick wire, while in galvanometers intended for hydro-electrical currents the wire is long and thin.

Nobili's Thermo-Electrical Battery.—Thermo-electrical batteries are apparatus intended for accumulating the thermo-electrical tensions produced in a circuit composed of several metals, when every other soldered junction is heated, the remaining junctions being kept all at the same temperature.

The first battery of this kind, which was constructed by Œrsted and Fourier, consisted of a series of bismuth and antimony bars, soldered successively one to the other in a straight line or in a circle. At every other soldered junction, the bismuth bars had a bent part at the end, which was dipped in ice at freezing point, while the other junctions were raised to a temperature far above boiling point by means of small lamps.

M. Nobili modified the form of the thermo-electrical battery with a view to include a large number of couples in a small space. For this purpose, he combined the bismuth and antimony couples in such a manner that, after having formed a series of five couples, as shown in fig. 476, he soldered the

Fig. 476

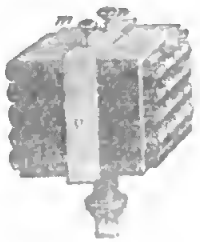


Fig. 477.



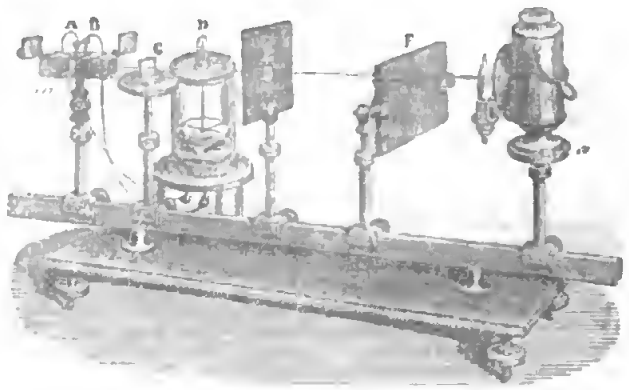
bismuth bar *b* laterally to the antimony of a second similar series, and the last bismuth bar of this to the antimony bar of a third series, and so on for four vertical series, containing altogether twenty couples, beginning with a bismuth and ending with an antimony bar. These couples, thus arranged, are isolated from one another by means of small strips of paper covered with varnish, and afterwards enclosed in a copper case P, fig. 477, in such a manner that only the soldered junctions are seen at the two ends of the battery. Two copper rods *m* and *n*, isolated in an ivory ring, communicate internally, the one with the first antimony bar, and the other with the last bismuth bar, the former representing the positive pole and the latter the negative. These rods are connected with the ends of the wire of a galvanometer, when we wish to observe the thermo-electrical current.

M. Melloni's Thermo-Multiplier.—The thermo-electrical battery constructed as represented in fig. 476, and combined with the galvanometer, has become, in the hands of M. Melloni, the most delicate thermometrical apparatus that is known. This philosopher, who has given the name of *thermo-multiplier* to the apparatus, has arranged it as seen in fig. 478.

Upon a wooden tablet, supported by four adjusting screws, is placed a copper rule perfectly upright, and about a yard long, with divisions into inches and fractions of inches. On this rule are placed at various distances, by means of adjusting screws, the different parts of which the apparatus is composed, as follows:—First, a support *a*, on which is placed a lamp or some other source of heat. Then screens r and s, followed by a second support c, on which are placed the objects upon which we wish to experiment. Lastly, there is the thermo-electrical battery *m*. Near the apparatus is a galvanometer D, furnished with a short thick wire, which is connected at A and B with the two poles of the battery. The delicacy of this instrument is such, that the heat of the hand a yard off is sufficient to develop in the battery a current capable of deflecting the needle of the galvanometer. The graduation of the galvanometer has been already explained.

To employ the thermo-multiplier for measuring temperature, we must first ascertain the relation subsisting between the deflection of the needle (and consequently the intensity of the current) and the difference of the temperatures of the soldered junctions. The temperatures of the soldered junctions not exposed to the source of heat, being once known, the deflection gives that of the other junctions, and consequently the temperature of the source of heat.

Fig. 478.



BIOGRAPHY.—No. XXIII.

FELICIA DOROTHEA HEMANS.

Felicia Dorothea Hemans was the second daughter and fourth child of a family of three sons and three daughters. She was born in Duke-street, Liverpool, on the 25th of September, 1794. Her father, Mr. Browne, was a native of Ireland, and her mother, a Miss Wagner, was of Venetian origin. As a child, Felicia was remarkably beautiful, and she early gave indications of her poetic genius, which was encouraged by her accomplished mother. When Miss Browne was about five years old, domestic embarrassments led her father to remove to Gwrych, in North Wales.

That land of wild mountain scenery and ancient minstrelsy was the fitting place to impart sublimity to her youthful fancies, and elevate her feelings with the glow of patriotism and devotion. She began to write when very young; her first

printed poems, entitled "Early Blossoms," were issued in 1808, when she was fourteen.

In 1809 her family removed from Gwryoh to Bronwylfa, near St. Asaph, in Flintshire, where she resided for sixteen years and wrote many of her works. It was during this year, 1809, that the great event of her life took place—her introduction to Captain Hemans. The young poetess was then only fifteen, in the full glow of that beauty which was destined to fade so early. The mantling bloom of her cheeks was shaded by a profusion of natural ringlets, of a rich golden brown, and the ever-varying expression of her brilliant eyes gave a changeful play to her countenance, which would have made it impossible for any painter to do justice to it. No wonder that so fair a creature should excite the admiration of a gallant captain. And the love on both sides was ardent and sincere, for Captain Hemans, soon after their introduction, was called upon to embark with his regiment for Spain. On his return in 1812, they were married.

Mrs. Hemans' eagerness for knowledge continued to be intense, and of her industry volumes, still existing, of extracts and transcriptions are evidence. The mode of her studies was very desultory to outward appearance, as she loved to be surrounded by books of all sorts and languages and on every variety of topic, turning from one to another. And this course, it is said, "she pursued at all times—in season and out of season—by night and day—on her chair, her sofa and bed—at home and abroad—invalid, convalescent and in perfect health—in rambles, journeys and visits—in company with her husband, and when her children were around her at hours usually devoted to domestic claims, as well as in the solitude of the study and bower."

In the year 1818, Captain Hemans' health requiring the benefit of a warmer climate, he determined upon repairing to the Continent, and eventually fixed his residence at Rome. At this time a permanent separation was not contemplated by either party, and it was only a tacit and conventional arrangement, with a frequent interchange of correspondence relative to the education and disposal of the children. But years rolled on, and from that time till the hour of her death, Captain and Mrs. Hemans never met again. She continued to reside with her mother at Bronwylfa, and had the five boys left under her care; a sufficient proof that nothing more than incompatability of pursuits and uncongeniality of temper were the moving causes of their separation.

Notwithstanding the peculiarity of her situation in consequence of this separation, her talents, her amiable qualities, and the increasing popularity of her writings, continued to secure to Mrs. Hemans the warm attachment of several distinguished friends, among whom were Bishop Luxmore and Bishop Heber. With the latter she became acquainted in 1820, and he was the first literary character with whom she ever familiarly associated. To him she submitted the commencement of a poem entitled "Superstition and Revelation," which was, however, never completed by her; and at his suggestion she was first led to offer her "Vespers of Palermo" to the stage. This play, completed in June, 1821, was, after many theatrical delays, acted at Covent Garden, in December, 1823, but proved a failure. It, however, led to a correspondence with the poet Milman, who kindly interested himself in its behalf, and it was subsequently acted at Edinburgh with considerable success, with an epilogue written by Sir Walter Scott.

The death of her beloved mother, which occurred in 1827, was an irreparable loss to Mrs. Hemans; she had now no one to whom she could cling for protection, and her sensitive, dependent nature made the maternal shelter and security necessary to her happiness—almost to her own existence. As the care and education of her five sons now devolved entirely upon herself, she was induced to leave Wales, where her heart still clung, and settle at Wavertree, a small village near Liverpool, where she hoped to find superior advantages of education for her boys.

During the many years that Mrs. Hemans resided with her mother, the anxieties and responsibilities of housekeeping had never fallen to her lot, and her time and thoughts might be and were almost exclusively devoted to poetry and literature. But now domestic cares forced themselves upon her attention, and butchers' and grocers' bills intruded, as she observes, "in frightful array." In these household duties she felt but little interest, being, as she playfully describes herself, "little better than a grown-up Rosamond [Miss Edgeworth's naughty girl], who constantly lie in bed till it is too late to get up early—break my needles (when I use any)—leave my keys among my necklaces—answer all my amusing letters first, and leave the others to their fate." Elsewhere she says, "I am now for the first time in my life holding the reins of government independently—managing a household myself, and I never liked anything less than *ce triste empire de moi-même*."

In the summer of 1829 she visited Scotland, where she was cordially received by many distinguished visitors, among others, by Sir Walter Scott, with whom she spent two or three weeks very delightfully. When bidding her farewell, he said, "There are some whom we meet and should like ever after to claim as kith and kin, and *you* are one of these." On one occasion he observed: "One would say you had too many accomplishments, Mrs. Hemans, were they not all made to give pleasure to those around you." In 1830 Mrs. Hemans visited the Lakes, where she formed a personal acquaintance with Wordsworth, whose writings she had always admired. Mrs. Hemans was delighted with the scenery at Rydal Mount, and determined to hire a residence called Dove's Nest, beautifully situated in a very romantic spot on the banks of Windermere. She thus describes it in one of her letters:—

"The house was originally meant for a small villa, though it has long passed into the hands of farmers, and there is in consequence an air of neglect about the little demesne, which does not at all approach to desolation, and yet gives it something of touching interest. You see everywhere traces of love and care beginning to be effaced,—rose-trees spreading into wildness—laurels darkening the windows with their luxuriant branches; and I cannot help saying to myself, 'Perhaps some heart like my own in its feelings and sufferings, has here sought refuge and found repose.' The ground is laid out in rather an antiquated style, which, now that nature is beginning to reclaim it from art, I do not at all dislike. There is a little grassy terrace immediately under the window, descending to a small court with a circular grass-plot, in which grows one tall white rose-tree. You cannot imagine how I delight in that fair, solitary, neglected-looking tree. I am writing to you from an old-fashioned alcove in the little garden, round which the sweet-briar or the moss-rose tree had completely run wild, and I look down from it upon lovely Windermere, which seems at this moment even like another sky, so truly is every summer cloud and tint of azure pictured in its transparent mirror."

In 1831 she left England with her children, to take up her residence permanently in Dublin. The next four years were passed busily and rather pleasantly by Mrs. Hemans, who continued to write unceasingly, though a gradual decline in her health was perceptible to her friends. At the close of the year 1834 her health became very precarious, and the following spring brought symptoms of her approaching dissolution. The closing scene has been impressively described by one of her friends: "Mrs. Hemans was now too ill to leave her room, and was only laid upon a couch during the daytime, occasionally suffering severely. But all was borne with resignation and patience; and when not able to bear even the fatigue of reading, she had recourse to her mental resources, and as she lay on the sofa, she would repeat to herself whole chapters of the Bible, and page after page of Milton and Wordsworth. Her thoughts reverted frequently to the days of her childhood—to the old house by the sea-shore—the mountain rambles—the haunts and the books which had formed the delight of her childhood. She was wont to say to those who expressed pity for her situation, that 'she lived in a fair and happy world of her own, among gentle thoughts and pleasant images;' and in her intervals of pain she would observe, that 'no poetry could express, nor imagination conceive, the visions of blessedness that flitted across her fancy, and made her waking hours more delightful than those even that were given to temporary repose.'" Indeed, her sister observes, "At times her spirit would appear to be already half-etherealized, her mind would seem to be fraught with deep and holy and incommunicable thoughts, and she would entreat to be left perfectly alone in stillness and darkness, 'to commune with her own heart,' and reflect on the mercies of her Saviour."

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On the 15th of March, after receiving the holy sacrament, she became extremely ill, but a temporary improvement took place, and on the 26th of April she dictated to her brother (for she had for some time been constrained to employ an amanuensis) her "Sabbath Sonnet," the last strain of the sweet singer of the hearth, the home and the affections. On Saturday, the 28th of May, she sank into a peaceful slumber, which continued all day, and at nine o'clock in the evening her gentle spirit passed away without pain or struggle.

Her remains were deposited in a vault beneath St. Anne's Church, Dublin, almost close to the house where she died. A small tablet has been placed above the spot where she is laid, inscribed with her name, her age, and the date of her death, and with the following lines from a dirge of her own :—

"Calm on the bosom of thy God,
Fair spirit! rest thee now!
E'en while with us thy footsteps trod,
His seal was on thy brow.
Dust to the narrow home beneath,
Soul to its place on high;
They that have seen thy look in death,
No more may fear to die."

LESSONS IN GEOLOGY.—No. LXI.

By Thos. W. Jenkyn, D.D., F.G.S., F.R.G.S., etc.

CHAPTER V.

ON THE CLASSIFICATION OF ROCKS.

SECTION XII.

THE OLD RED SANDSTONE, OR THE DEVONIAN FORMATION.

You have already been informed that there exists, *above* the coal-measures, a series of red sandstone rocks, which are now divided into the Permian and the Trias, both of which groups were formerly called the New Red Standstone. They were called "new," because they constituted the commencement of the SECONDARY formation of rocks, in which were found no fossils of the more ancient or palæozoic animals.

There exists also another series of red sandstones, which generally lie *beneath* the mountain limestone, that is, beneath the foundation of the coal-measures. As this group of red sandstones had been formed long before the coal-measures, and consequently myriads of ages before the Trias, and as they contain only palæozoic fossils, they were called the Old Red Sandstone.

At the present day the group of Old Red Sandstones are called the DEVONIAN Formation, their identity having been established by SIR RODERICK MURCHISON. These rocks were first studied in their grand developments in Herefordshire and Breconshire. When rocks of the same colour and mineral character were examined in Devonshire, the strata there were found to contain the shells of the genus *Orthis*, *Spirifera*, *Productus*, and *Terebratula*, which were not found in the rocks of Breconshire and Herefordshire, which again, on the other hand, afforded fossil fishes that were not to be found in Devonshire. But, in 1840, Sir R. Murchison visited Russia, and discovered in strata of the Old Red Sandstone, the fossil fishes contained in the rocks of Herefordshire and Scotland, associated with the same fossil shells that were furnished by the rocks of Devonshire. The same geologist, in connection with Professor SEDGWICK, have also shewn, that in the Rhenish Provinces of Germany there exist beds equivalent to the Devonshire strata, and which contain both the corals and the shells which are characteristic of the Devonian rocks.

It is not many years ago since the Old Red Sandstone was regarded as nothing but a lower division of the coal formation; but the labours of Murchison, Sedgwick, and Hugh Miller have shown, that it contained palæontological character of sufficient distinctness to mark it out as an independent group.

I. THE LITHOLOGICAL CHARACTER OF THE DEVONIAN.

The Devonian rocks are of enormous thickness, varying from 8,000 to 10,000 feet, and are generally divided into three groups :—

I. Quartzy conglomerates and sandstone.
II. Cornstones and Marls.
III. Tilestones.

I. QUARTZY CONGLOMERATES AND SANDSTONE.

This is divided into two distinct beds.

1. The uppermost beds, which consist of quartzy pebbles and grits, hardened together by a cement that is slightly limy or calcareous. These conglomerates are, in colour, pink or reddish. The quartzy pebbles are water-worn or rounded fragments of some of the older rocks, such as Silurian slates, gneiss, etc.

In South Wales, these conglomerates are seen to great advantage at Symond's Yat, between Monmouth and Ross; and also on the right bank of the Wye, a little above Tintern Abbey.

2. Coarse-grained sandstone, of different colours—chocolate, brown, or reddish. These sandstones interstratify with clayey marls of a red or green colour. A quarry of them supplies flagstones.

These are well-developed in Breconshire, at a place called the Daren, near Crickhowell, and at Manr Bwlch y Chwyth, near Trecastle.

II. CORNSTONES AND MARLS.

This division consists of clayey marls, red and green and spotted, interstratified with bands of sandstone, and with irregular courses of what are called in Herefordshire, Cornstones. The cornstone is an impure, earthy limestone, consisting usually of small concretionary lumps only, but occasionally appearing in large subcrystalline masses. These cornstones are, in colour, mottled, red, or green.

The cornstones and marls exhibit themselves in the Vale of Usk, near Abergavenny; in the Cliffs of Llanstephan Castle, below Carmarthen; and in the western face of the Brown Clee Hill, near Ludlow.

III. TILESTONES.

This lower division of the Old Red Sandstone consists of micaceous and quartzy grit, finely laminated or slaty, and is therefore easily separated into flags for causeways, and tiles for roofing houses. In consistency they are very hard, and in colour, reddish or green.

These Tilestones can be most advantageously studied in a section under HEREB CHAPEL, in Cwm Dwr, a few miles to the south of Landevery, and in one of the heights above the River Teme, between Ludlow and Downton Castle.

This outline is sufficient to give a general notion of the lithological characteristics of the Old Red Sandstone. Its most magnificent and enormous development is in South Wales and Herefordshire; but immense beds of it are also found in Devonshire, and in the northern parts of Scotland. On the continent it is largely developed in the provinces on the Rhine; and in Russia, it alone covers an area larger than the entire space of Great Britain. In different countries it may be expected to differ in mineral character.

In South Devonshire and in Cornwall, the Old Red Sandstone rocks are found associated with slaty and limy strata, which consist of green chlorite slate, alternating with quartzy shales and sandstones, accompanied with blue and grey limestones, which pass into red sandstones and conglomerates. This class of rocks was formerly referred to a group called "the transition," or the most ancient fossiliferous series, till they were ascertained by Sir R. Murchison and Professor Sedgwick to be really Old Red Sandstone beds, and which they demonstrated by their true position in the series, and by their type of fossils.

In Scotland, the uppermost parts of the Old Red Sandstone differ from those of Herefordshire and South Wales. These parts are best seen at their junction with the lowest member of the coal-measures, as developed in Dura Den, to the south of Cupar, in Fifeshire. There it consists of—

1. Bands of yellow sandstone, in which the scales of a sauroid, or lizardish fish, called *Holoptychius*, and the fossil *Pterichthys* were first discovered.

2. The Sidlaw and Strathmore beds—which are seen between

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Stonehaven and the Frith of Clyde, forming the Sidlaw hills and the valley of Strathmore—a series of beds several thousand feet thick, and lying as follows:—

c. Red and mottled marls, cornstones and sandstones.
b. Conglomerate beds of vast thickness.
a. Paving and roofing, of a grey colour.

II. THE ORGANIC REMAINS OF THE DEVONIAN.

1. The Old Red Sandstone, as we have said, used to be thought so destitute of fossils, that it was difficult to mark it as a separate group; but through the researches of Murchison, Sedgwick, and Hugh Miller, it has been raised to the rank of an independent formation of palæozoic rocks, distinguished by a well-defined type of organic remains. This was done by the discovery and by the establishment that the Devonshire limestones, which were so rich in fossils, were in reality rocks of the Old Red Sandstone age.

2. In the Old Red Sandstone we find distinct and new forms of existence—that is, new when compared with the inhabitants of the waters that had deposited the grey rocks of the Silurians beneath them; and distinct both from them, and also from the organisms of earliest bands of the coal-measures above them; so distinct, indeed, that they altogether differ from any animals found in either of the newer formations.

3. The fossils occur chiefly in those strata where limy matter is most diffused. Scales and some fragments of fish have been found in cornstones, but the best preserved fossils are supplied by the finely-laminated flagstones, and in the marls, which are contiguous to limestones.

4. Plants. For many years the only traces of plants found in the Devonians consisted of impressions of sea-weeds, or fucoids, which were discovered in great abundance on the surfaces of laminated sandstones in Forfarshire. Afterwards, Mr. Hugh Miller discovered at Cromarty, in the lower division of the Old Red Sandstone, the remains of a land-plant. This deserves to be remembered, as it *is*, probably, the most ancient cone-bearing wood in the creation.

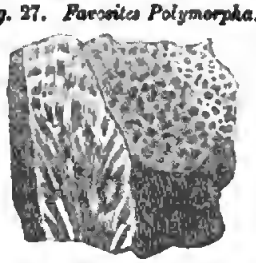
Since then, land-plants have been found in the sandstone at Lerwick in Shetland, something like the calamites or horsetails found in the coal-rocks. In the Devonians of Ireland, also, there have been found at Knocktopher, Kilkenny, species of tree-ferns differing widely from those of the overlying coal. This has been called *Cyclopteris Hibernicus*, and deserves also to be remembered, as being the oldest of tree-ferns as yet known in the crust of the globe.

It has been lately proved by Dr. Flemming, that fruit-like clusters found in the paving-stones of Forfarshire, which were supposed by Sir Charles Lyell to be the eggs of a shell-fish, and by Dr. Mantell to be the eggs of a batrachian, or frog-like animal, are, in truth, a receptacle of a land-plant covered with carpels or fruits.

5. Zoophytes. Among the limestones of the Old Red Sandstones, Corals and Crinoides, or lily-shaped corals, are very numerous, many of which are common to the mountain limestone, to the Silurian lime-rocks, and to the Devonian marbles, as may be instanced in the beautiful corallina marbles of Torquay and Babbacome Bay in Devonshire.

The most abundant corals are the *Favosites* and the *Cyathophyllum*. The following engraving (fig. 27) represents the polished surface of a specimen of *Favosites*:—

Fig. 27. Favosites Polymorpha.



6. Shells. The Devonian beds, which were found in the sea and are called marine strata, are very rich in fossil shells, and contain some of peculiar types. In the Old Red Sandstone of Scotland shells are rare, while that of Devonshire abounds in shells and crustaceans, or animals who, like the crab, live in a bony crust. Some of the most numerous shells are the *Bucsinum*, *Turbo*, *Pecten*, *Avicula*, etc. In reference to the shells, one of the most remarkable circumstances is, the great abundance of some of the most ancient types that lived during the Silurian period—such as *Atrypa*, *Spirifera*, and *Terebratula*. Among the higher order of shells, we have the *Bellerophon*. The forms of shells which are exclusively Devonian are, the *Calceola Sandalina*, and the *Strygocephalus magalodon*, *Cucullatus*, and *Clymenia*. One of the most peculiar crustaceans of the Devonian is a species of trilobite, called *Brontes Flabellifer*.

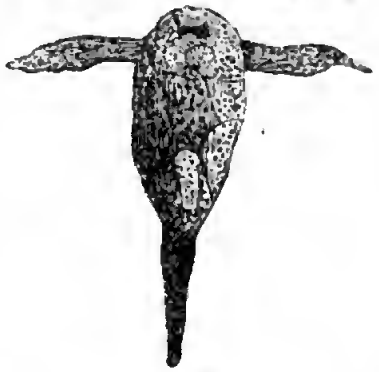
7. Fishes. It is in the Old Red Sandstone that we first meet with an animal vertebrated, or having a back-bone. In the vast thickness of the Silurian rocks, no beds furnish any trace of a back-boned animal, except those which are the highest and latest, and which usher in the Devonian age.

Though the Old Red Sandstones present their grandest development in Herefordshire and Breconshire, they, in the whole of that district, furnish but very few fragments of fish, while in Scotland they yield scarcely any other class of fossils. The entire Devonians of the globe have supplied 100 species of fish, and of that number sixty-five have been furnished by Scotland. The most prevalent of these remains are fossil fishes that belong to the genera *Holoptychius*, *Pterichthys*, *Cephalaspis*, *Coccosteus*, *Dipterus*, and *Diplopterus*.

The *Holopthychius* is a kind of sauroid or lizard-like fish, some of which were thirty feet long, and their scales were three inches long and about two and a-half in breadth. It had plates to cover and defend its head. This has been found in upper divisions of the sandstone.

The *Pterichthys*, a name which means the *winged-fish*, had wing-like appendages attached to each side of the head, as represented in fig. 28.

Fig. 28. The Pterichthys—the upper side.



Of the *Pterichthys*, eight different species have been discovered. Upon the first discovery of them, the wing-like or the oar-like blades attached to their heads were supposed by Mr. Hugh Miller to be paddles, like those of the turtle, but M. Agassiz has shown that they were mere weapons of defence. In times of danger they were extended, as represented in the figure; but at other times they lay close to the creature's side. The tail seems to have been the only instrument of motion in the waters.

The species found in the British Devonians are generally small, from eight to ten inches long. Some, however, were much larger, for in the Murchison collection there is one whose wing-like blades are a foot in length.

The *Cephalaspis*, which means the *buckler-headed fish*, is a genus of fish that has its head covered by a shield or buckler, fig. 29.

The plates which cover and defend the head are united into one bony case, jointed something like the plates of the lobster. The entire body of the fish is covered with scales, but the scales of the head are highly ornamented with radiated markings. Many specimens of this fish have been found in England, Scotland, and Russia, but the discovery of them has been chiefly limited to the middle group of the Old Red Sandstone, called the cornstones and marls

The *Coccosteus*, or the *berry-bone fish*, had a large head covered with bony plates, like the *Pterichthys*. In its mouth it had conical teeth, and its body terminated in a long flexible tail, which was the instrument of motion. Four or five different species have been discovered, varying in length from a few inches to two feet.

The Old Red Sandstone has furnished specimens of other kinds of fish, called *Dendrodus*, *Dipterus*, *Diplopterus*, *Osteolepis*, *Glyptolepis*, *Cheiracanthus*, etc. The one thing in which they all agree is, that they have all bony or horny plates to defend the upper parts of the body and the head.

Fig. 29. Cephalaspis Lyellii.



8. Reptiles.—Within the last three years, Mr. Duff, of Elgin in Scotland, found, in the light-coloured Sandstones near the Murray Frith, a more certain inhabitant of the land than even Dr. Flemming's fruits, and that was an air-breathing animal, which Dr. Mantell has called *Telerpeton Elginense*, about the size and the shape of a frog. Of Reptiles, this is the oldest in the Creation.

IV. SOME GEOLOGICAL PHENOMENA OF THE DEVONIAN PERIOD.

1. The Old Red Sandstones are deposits that have been accumulating, for innumerable ages, in the profound depths of the ocean, into which large rivers and powerful torrents, charged with the detritus of the lands over which they flowed, emptied themselves, and embedded the remains of plants and animals that existed during that period.

2. In examining the geological history of the Old Red Sandstone upward, we find the following facts. At the close of the Silurian period, great changes took place both in the mineral character and in the colour of the deposits; for the grey mud of the Silurians was succeeded by red sediments, which were deposited over large areas of those seas. The red colour is probably derived from the oxides of iron which had perhaps been imported and diffused by the wear and tear of some underlying gneissic or granitic rocks.

3. The hundreds or thousands of centuries occupied in forming deposits of such enormous thickness as 10,000 feet, or nearly one mile in depth in South Wales, must have formed in other regions accumulations, varying in character from those of Herefordshire and Breconshire, but still being what geologists call equivalent beds. On this supposition, the vast series of beds in North Devon, though differing in lithological character, are found to occupy precisely the same position of strata, that were formed in the same geological time as the Old Red Sandstone of South Wales.

4. There are geological facts, clearly ascertained, that will account for such variations in equivalent rocks of the Devonian period. For instance: the eruption of the molten granite of Dartmoor would be likely to affect both the Devonian beds and the coal measures that were in contact with them, so that the clear order of the strata can hardly be ascertained. Some of the laminated, slaty, or schistose bands have been so metamorphosed or altered, and so mineralised, that they have every appearance of belonging to the oldest primary or Silurian rocks. The crystalline aspect, and the slaty cleavage of these Devonian rocks, were impressed upon them long after the age of their actual deposition, and that by the eruption of the Dartmoor granite. The change also in colour, from the red sand of the South Wales Devonian to the red and grey muds of the Devonshire rocks, is by no means sudden, but resembles the gradual change exhibited in Pembroke. And if you imagine that in the region now called Devon, there was, in the Old Red Sandstone age, a less diffusion of the oxide of iron, you can account why the Devonshire beds have less of the red and sandy character than those of South Wales have.

5. The change from the Silurian to the Devonian age was evidently very gradual. In the lowest beds of the Old Red Sandstones, that is, in the beds which lie nearest to the underlying Silurians, it is only by the detection of the *upper* Ludlow fossils, in the *lower* strata, or the tilestones of the Devonians, and which are often of a reddish colour, that the limit between the two groups of rocks can be distinctly marked out. The similarity between the upper Silurians and the lower Devonians show how gradual was the mineral transitions from the older to the newer.

6. The physical and mineral changes which took place at the commencement of the Old Red Sandstone, were accompanied by the disappearance of certain sea organisms that characterised the Silurian epoch, and they ushered in a new and an advanced creation of animals, adapted to the altered conditions of the globe. In the Old Red Sandstone we have the seat and commencement of the earliest vertebrata, or back-boned animals, that have been yet recognised.

In some of the underlying bands we detect, indeed, a few small fishes, but in the true Devonians we find a profusion of larger fishes, with their back-bones but imperfectly bony, and with their forms differing exceedingly from any kind of fish found in the present ocean.

In this age, also, we meet with well-ascertained land-plants, which are of much larger dimensions than the very rare ones found in the upper Silurians.

Towards the close of the Old Red Sandstone period, we find that an air-breathing animal, now called the Telerpeton—the first reptile in creation—was formed, and lived amid groves of tree-ferns and of cone-bearing trees, among the roots of which it could nestle.

7. At Louisville, Kentucky, North America, there is a magnificent display of one of the limestone beds of the Devonian age. In aspect, it much resembles a modern coral reef. Imagine an extensive area, whose surface is all a red, gritty sandstone, occasionally overflowed with the waters of a large river like the Ohio. When such a sandstone is acted upon by the impetuosity and the weight of the river, the softer parts of the surface rock are washed away. As this is done, new forms of the bed are developed. These are coral masses, which, being harder than the sandstone, resist the action of the water, and now stand out in relief, like small bushes, many of them sending out their branches from their erect stems, some of them five feet in diameter, and present themselves just as they were growing at the bottom of the Old Red Sandstone sea myriads of years ago.

8. The deep excavations or scoopings which are found in the beds of the Old Red Sandstone furnish clear examples of the enormous denudations which took place by the action of currents. In many districts the Silurians and the granitic rocks, which in our day form the surface, must have been, at one time, all covered with the beds of the Old Red Sandstone, but have since that time been washed away by the gradual action of running water. Of this enormous denudation, two examples will suffice. In Scotland, on the western coast of Ross-shire, the Old Red Sandstone forms three immense hills insulated from each other. These are called Suil Veun, Coul Beg, and Coul More. The horizontal regularity of the beds of these three mountains prove that they were once continuous and formed but one mass. The proof is as clear as if a brick

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wall had been broken through in two places, and had three portions remaining of their original height. What has become of all rock that once stood between them? They have been removed by the denuding action of water.

There is another remarkable instance of denudation in the valley of the Usk, near Crickhowell, South Wales. This valley is a deep scooping that began in the coal formation, and continued to deepen into some of the lower beds of the Old Red Sandstone. To the north of Crickhowell is a high rock, called Pen Cerrig Calch, which consists of an outlier or patch of the mountain limestone that is seen on the top of the mountain on the south side towards the Bryo Mawr coal-works. Pen Cerrig Calch is more than 2,500 feet above the level of the sea. The Crickhowell valley is good 2,000 feet deep in the Old Red Sandstone. It is evident then that, at one time, not only was the red sandstone a continuous mass from the north side to the south side of the present valley, but the mountain limestone that rests on the Old Red Sandstone was also a continuous and an uninterrupted bed. What has become of all those enormous masses of limestones and sandstones? They have been removed by denudation.

LESSONS IN ALGEBRA.—No. XXX.

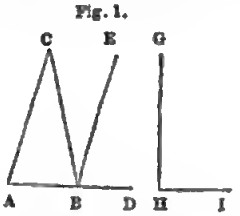
(*Continued from page* 251.)

APPLICATION OF ALGEBRA TO GEOMETRY.

It is often expedient to make use of algebraical notation, for expressing the relations of geometrical quantities, and to throw the several steps of a demonstration into the form of equations. By this, the nature of the reasoning is not altered. It is only translated into a different *language*. *Signs* are substituted for *words*, but they are intended to convey the same meaning. A great part of the demonstrations in geometry really consist of a series of equations, though they may not be presented to us under the algebraic forms. Thus the proposition, that *the sum of the three angles of a triangle is equal to two right angles*, may be demonstrated, either in common language, or by means of the signs used in algebra.

Let the side A B, of the triangle A B C, fig. 1, be produced

Fig. 1.



to D; let the line B E be drawn parallel to A C; and let G H I be a right angle.

The demonstration in words, is as follows:

1. The angle E B D is *equal* to the angle B A C. (Euclid 29, 1.)
2. The angle C B E is *equal* to the angle A C B.
3. Therefore, the angle E B D *added* to C B E, that is, the angle C B D, is *equal* to B A C *added* to A C B.
4. If to these equals, we add the angle A B C, the angle C B D *added* to A B C, is *equal* to B A C *added* to A C B and A B C.
5. But C B D *added* to A B C, is *equal* to twice G H I, that is, to two right angles. (Euclid 13, 1).
6. Therefore, the angles B A C, and A C B, and A B C, are together equal to twice G H I, or two right angles.

Now by substituting the sign +, for the word *added*, or *and*, and the sign =, for the word *equal*, we shall have the same demonstration in the following form.

1. By Euclid 29, 1. E B D = B A C
2. And C B E = A C B Euclid 29, 1
3. Add the two equations E B D + C B E = B A C + A C B
4. Add A B C to both sides C B D + A B C = B A C + A C B + A B C
5. But by Euclid 13, 1. G B D + A B C = 2 G H I
6. Therefore B A C + A C B + A B C = 2 G H I.

By comparing, one by one, the steps of these two demonstrations, it will be seen that they are precisely the same, except that they are differently expressed.

It will be observed that the notation in the example just given, differs, in one respect, from that which is generally used in algebra. Each quantity is represented, not by a *single letter*, but by *several*. In common algebra when one letter stands immediately before another as *ab*, without any character between them, they are to be considered as *multiplied* together.

But in geometry, A B is an expression *for a single line*, and not for the product of A into B. Multiplication is denoted, either by a point or by the sign ×. The product of A B into C D, is A B · C D, or A B × C D.

There is no impropriety, however, in representing a geometrical quantity by a single letter. We may make *b* stand for a line or an angle, as well as for a number.

If in the example above, we put the angle

E B D = *a*,	A C B = *d*,	A D C = *h*,
B A C = *b*,	C B G = *g*,	G H I = *l*,
C B E = *e*,		

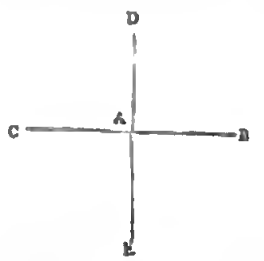
the demonstration will stand thus:

1. By Euclid 29, 1,	$a = b$
2. And	$e = d$
3. Adding the two equations,	$a + e = g = b + d$
4. Adding *h* to both sides,	$g + h = b + d + h$
5. By Euclid, 13, 1,	$g + h = 2l$
6. Therefore	$b + d + h = 2l$

This notation is apparently more simple than the other; but it deprives us of what is of great importance in geometrical demonstrations, a continual and easy reference to the figure. To distinguish the two methods, *capitals* are generally used for that which is peculiar to geometry; and *small letters*, for that which is properly algebraic.

If a line whose length is measured from a given point or line, be considered *positive*; a line proceeding in the *opposite* direction must be considered *negative*. If A B, fig. 2, reckoned

Fig. 2.



from D B on the *right*, is positive; A C on the *left* is negative. Hence, if, in the course of a calculation, the algebraical value of a line is found to be *negative*, it must be measured in a direction opposite to that which, in the same process, has been considered positive.

In algebraical calculations, there is frequent occasion for *multiplication*, *division*, *involution*, etc. But how, it may be asked, can *geometrical* quantities be multiplied into each other? One of the factors in multiplication is always to be considered as a *number*. The operation consists in repeating the multiplicand as many times as there are *units* in the multiplier. How then can a *line*, a *surface*, or a *solid*, become a multiplier?

To explain this it will be necessary to observe, that whenever one geometrical quantity is multiplied into another, some *particular length* is to be considered *the unit*. It is immaterial what this length is, provided it remains the same in different parts of the same calculation. It may be an inch, a foot, a rod or a mile. If, for instance, one of the lines be a foot long, and the other half a foot; the factors will be, one 12 inches, and the other 6, and the product will be 72 inches. Though it would be absurd to say that one line is to be repeated *as often as another is long*; yet there is no impropriety in saying that one is to be repeated as many times as there are feet or rods in the other. This, the nature of a calculation often requires.

If the line which is to be the multiplier is only a *part* of

the length taken for the unit, the product is a like part of the multiplicand. Thus, if one of the factors is 6 inches, and the other half an inch, the product is 3 inches.

Instead of referring to the measures in common use, as inches, feet, etc., it is often convenient to fix upon one of the lines in a figure, as the unit with which to compare all the others. When there are a number of lines drawn within and about a *circle*, the *radius* is commonly taken for the unit. This is particularly the case in trigonometrical calculations.

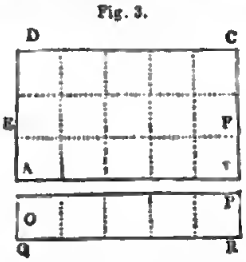
The observations which have been made concerning lines, may be applied to *surfaces* and *solids*. There may be occasion to multiply the *area* of a figure by the number of inches in some given line.

But here another difficulty presents itself. The product of two lines is often spoken of as being equal to a *surface*; and the product of a line and a surface, as equal to a *solid*. But if a line has no *breadth*, how can the multiplication, that *is*, the *repetition*, of a line, produce a surface? And if a surface has no thickness, how can a repetition of it produce a solid?

In answering these inquiries it must be admitted that measures of length do not belong to the same class of magnitudes with superficial or solid measures; and that none of the steps of a calculation can, properly speaking, transform the one into the other. But, though a line cannot become a surface or a solid, yet the several measuring units in common use are so adapted to each other, that squares, cubes, etc., are bounded by lines of the same name. Thus the side of a square inch is a linear inch; that of a square rod, a linear rod, etc. The *length* of a linear inch is, therefore, the same as the length or breadth of a square inch.

If then several square inches are placed together, as from Q to R, fig. 3, the *number* of them in the parallelogram O R is the

Fig. 3.



same as the number of linear inches in the side Q R: and if we know the length of this, we have of course the area of the parallelogram, which is here supposed to be one inch wide.

But if the breadth is *several* inches, the larger parallelogram contains as many smaller ones, each an inch wide, as there are inches in the whole breadth. Thus, if the parallelogram A C, fig. 3, is 6 inches long and 3 inches broad, it may be divided into three such parallelograms as O R. To obtain, then, the number of squares in the large parallelogram, we have only to multiply the number of squares in one of the small parallelograms, into the number of such parallelograms contained in the whole figure. But the number of square inches in one of the small parallelograms is equal to the number of linear inches in the *length* A E. And the number of small parallelograms is equal to the number of linear inches in the *breadth* E C. It is therefore said concisely, that *the area of a parallelogram is equal to its length multiplied into its breadth*.

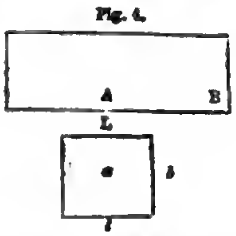
We hence obtain a convenient algebraical expression for the area of a right-angled parallelogram. If two of the sides perpendicular to each other are A B and B C, the expression for the area is A B × B C; that is, putting a for the area,

$$a = \text{A E} \times \text{B C}.$$

It must be remarked, however, that when A B stands for a *line*, it contains only *linear* measuring units; but when it enters into the expression for the *area*, it is supposed to contain *superficial* units of the same name.

The expression for the area may also be derived by another method more simple, but less satisfactory perhaps to some. Let a, fig. 4, represent a square inch, foot, rod, or other measuring unit; and let *b* and *l* be two of its sides. Also, let A be the area of any right-angled parallelogram, B its breadth, and L its length. Then it is evident, that, if the breadth of each were the same, the areas would be as the

Fig. 4.



lengths; and, if the length of each were the same, the areas would be as the breadths.

That is,	A : a : : L : *l*,	when the breadth is given;
And	A : a : : B : *b*,	when the length is given:
Therefore,	A : a : : B × L : *b* × *l*,	when both vary.

That is, the area is as the *product* of the *length* and *breadth*.

Hence, in solving problems in geometry, the term *product* is frequently substituted for *rectangle*. And whatever is there proved concerning the equality of certain rectangles, may be applied to the product of the lines which contain the rectangles.

The area of an *oblique* parallelogram is also obtained by multiplying the base into the perpendicular height. Thus the expression for the area of the parallelogram A E N M, fig. 5, is M N × A D, or A B × E C. For A E × B C is the area of the

Fig. 5.

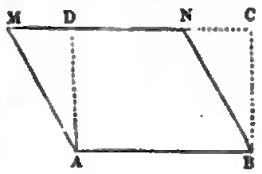
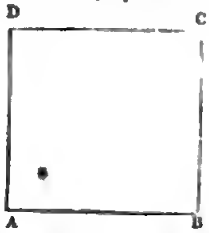


Fig. 6.



right-angled parallelogram A B C D; and by Euclid 36, 1, parallelograms upon equal bases, and between the same parallels, are equal; that is, A B C D is equal to A E N M.

The area of a *square* is obtained by multiplying one of the sides *into itself*. Thus the expression for the area of the square A C, fig. 6, is $(\text{A B})^2$, that is, $a = (\text{A E})^2$.

For the area is equal to A E × B C.

But A E = B C, therefore, A B × B C = A B × A B = $(\text{A E})^2$.

The area of a *triangle* is equal to *half* the product of the base and height. Thus the area of the triangle A E O, fig. 7, is equal to half A E into O H or its equal B C, that is,

$$a = \tfrac{1}{2}\,\text{A B} \times \text{B C}.$$

For the area of the parallelogram A B C D is A B × B C. And by Euclid 41, 1, if a parallelogram and a triangle are upon the same base, and between the same parallels, the triangle is half the parallelogram.

Hence, an algebraical expression may be obtained for the area of any figure whatever which is bounded by right lines. For every such figure may be divided into triangles.

Fig. 7.

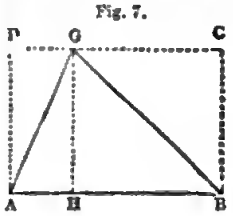
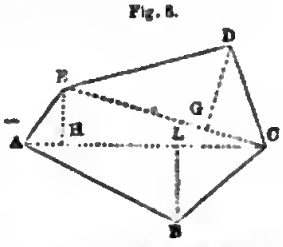


Fig. 8.



Thus the right-lined figure, A B C D E, fig. 8, is composed of the triangles A B C, A C D and A E D.

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The area of the triangle $\text{A B O} = \frac{1}{2}\text{A C} \times \text{B L}$,
That of the triangle $\text{A O B} = \frac{1}{2}\text{A C} \times \text{B H}$,
That of the triangle $\text{B O D} = \frac{1}{2}\text{B O} \times \text{D O}$.

The area of the whole figure is, therefore, equal to

$$(\tfrac{1}{2}\text{A O} \times \text{B L}) + (\tfrac{1}{2}\text{A C} \times \text{B H}) + (\tfrac{1}{2}\text{B O} \times \text{D O}).$$

The expression for the *superfices* has here been derived from that of a *line* or *lines*. It is frequently necessary to *reverse* this order; to find a *side* of a figure, from knowing its *area*.

If the number of square inches in the parallelogram A B C D, fig. 3, whose breadth B O is 3 inches, be divided by 3, the quotient will be a parallelogram, A B E F, *one* inch wide, and of the same length with the larger one. But the length of the small parallelogram is the length of its side A B. The number of *square* inches in one is the same as the number of *linear* inches in the other. If, therefore, the area of the large parallelogram be represented by a, the side $\text{A B} = \frac{a}{\text{B O}}$, that is,

the length of a parallelogram is found by dividing the area by the breadth.

If a be put for the area of a *square* whose side is A B,
Then $a = (\text{A B})^2$,
And extracting both sides, $\sqrt{a} = \text{A B}$.

That is, *the side of the square is found, by extracting the square root of the number of measuring units in its area.*

If A B be the base of a *triangle*, and B O its perpendicular height;
Then $a = \frac{1}{2}\text{B C} \times \text{A B}$

And dividing by $\frac{1}{2}$ B C, $\frac{a}{\frac{1}{2}\text{B C}} = \text{A B}$,

That is, *the base of a triangle is found, by dividing the area by half the height.*

As a *surface* is expressed by the product of its length and breadth, the contents of a *solid* may be expressed by the product of its length, breadth and depth. It is necessary to bear in mind, that the measuring unit of solids is a *cube*; and that the side of a cubic inch is a square inch; the side of a cubic foot, a square foot, etc.

Let A B C D fig. 3, represent the base of a parallelopiped, five inches long, three inches broad, and *one* inch deep. It is evident there must be as many *cubic* inches in the solid, as there are *square* inches in its base. And as the product of the lines A B and B C gives the area of this base, it gives, of course, the contents of the solid. But suppose that the depth of the parallelopiped, instead of being *one* inch, is *four* inches. Its contents must be four times as great. If, then, the length be A B, the breadth B O, and the depth O O, the expression for the solid contents will be, A B × B O × O O.

By means of algebraical notation, a geometrical demonstration may often be rendered much more simple and concise than in ordinary language. The proposition, (Euclid 4, 2,) that when a straight line is divided into two parts, the square of the whole line is equal to the squares of the two parts, together with twice the product of the parts, is demonstrated, by squaring a binomial.

Let the side of a square be represented by s;
And let it be divided into two parts a and b.
By the supposition, $s = a + b$;
And squaring both sides, $s^2 = a^2 + 2ab + b^2$.

That is, s^2 the square of the whole line, is equal to a^2 and b^2, the squares the two parts, together with $2ab$, twice the product of the parts.

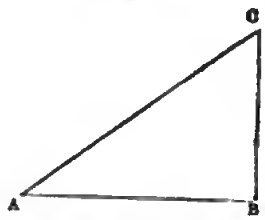
Algebraical notation may also be applied, with great advantage, to the solution of geometrical *problems*. In doing this, it will be necessary, in the first place, to form an algebraical equation from the geometrical relations of the quantities given and required; and then by the usual reductions, to find the value of the unknown quantity in this equation.

Prob. 1. Given the *base*, and the *sum* of the hypothenuse and perpendicular, of the right-angled triangle A B C, fig. 9, to find the perpendicular.

Let the base $\text{A B} = b$
The perpendicular $\text{B O} = x$
The sum of hyp. and perp. $s + \text{A C} = a$
Then transposing x, $\text{A O} = a - x$
1. By Euclid 47, 1, $(\text{B O})^2 + (\text{A B})^2 = (\text{A C})^2$
2. That is, by the notation, $x^2 + b^2 = (a-x)^2 = a^2 - 2ax + x^2$

And, $x = \frac{a^2 - b^2}{2a} = \text{B O}$, the side required. Hence,

Fig. 8.



In a right angled-triangle, the perpendicular is equal to the square of the sum of the hypothenuse and perpendicular, diminished by the square of the base, and divided by twice the sum of the hypothenuse and perpendicular.

It is applied to particular cases by substituting *numbers* for the letters a and b. Thus if the base is 8 feet, and the sum of the hypothenuse and perpendicular 16, the expression $\frac{a^2 - b^2}{2a}$ becomes $\frac{16^2 - 8^2}{2 \times 16} = 6$, the perpendicular; and this subtracted from 16, the sum of the hypothenuse and perpendicular, leaves 10, the length of the hypothenuse.

Prob. 2. Given the *base* and the *difference* of the hypothenuse and perpendicular of a right-angled triangle, to find the perpendicular.

Fig. 10.

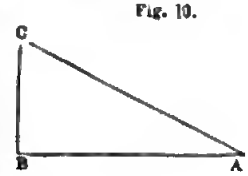
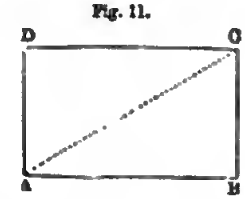


Fig. 11.



Let the base, fig. 10, $\text{A B} = b = 20$
The perpendicular $\text{B O} = x$
The given difference of A C and A O $= d = 10$.
Then will the hypothenuse $\text{A C} = x + d$.
1. Then by Euclid 47, 1, $(\text{A C})^2 = (\text{A B})^2 + (\text{B C})^2$
2. That is, by the notation, $(x + d)^2 = b^2 + x^2$
3. Expanding $(x + d)^2$, $x^2 + 2dx + d^2 = b^2 + x^2$
4. Therefore $x = \frac{b^2 - d^2}{2d} = 15$.

Prob. 3. If the hypothenuse of a right-angled triangle is 3 feet, and the difference of the other two sides 6 feet, what is the length of the base?

Prob. 4. If the hypothenuse of a right-angled triangle is 50 rods, and the base is to the perpendicular as 4 to 3, what is the length of the perpendicular?

Prob. 5. Having the perimeter and the diagonal of a parallelogram A B O D, fig. 11, to find the sides.

Let the diagonal $\text{A O} = h = 10$
The side $\text{A B} = x$
Half the perimeter $\text{B O} + \text{A B} = \text{B C} + s = b = 14$
Then by transposing x, $\text{B O} = b - x$.

Prob. 6. The area of a right-angled triangle A B C, fig. 12, being given, and the sides of a parallelogram inscribed in it, to find the side B O.

Prob. 7. The three sides of a right-angled triangle A B C, fig. 13, being given, to find the segments made by a perpendicular, drawn from the right angle to the hypothenuse.

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The perpendicular will divide the original triangle into two right-angled triangles, D C D and A B D. (Euclid 8, 6).

Fig. 12.

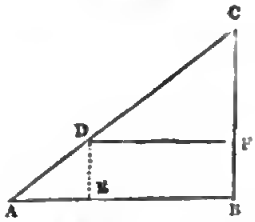
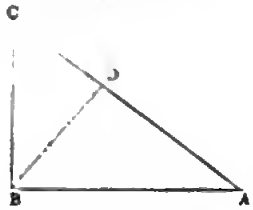
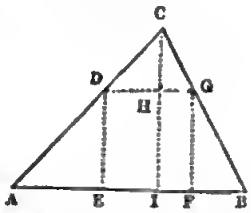


Fig. 13.



Prob. 8. Having the area of a parallelogram D E F C, fig. 14,

Fig. 14.



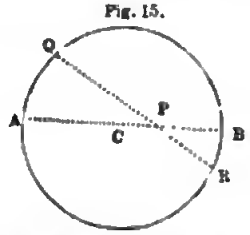
inscribed in a given triangle A B C, to find the sides of the parallelogram.

Draw O I perpendicular to A B. By supposition, D C is parallel to A B.

Prob. 9. Through a given point, in a given circle, to draw a right line, so that its parts, between the point and the periphery, shall have a great difference.

In the circle A Q B R, fig. 15, let P be a given point in the diameter A B.

Fig. 15.



Prob. 10. If the sum of two of the sides of a triangle be 1156, the length of a perpendicular drawn from the angle included between these to the third side be 300, and the difference of the segments made by the perpendicular be 495; what are the lengths of the three sides?

Prob. 11. If the perimeter of a right-angled triangle be 720, and the perpendicular falling from the right angle on the hypothenuse be 144; what are the lengths of the sides?

Prob. 12. The difference between the diagonal of a square and one of its sides being given, to find the length of the sides.

Prob. 13. The base and perpendicular height of any plane triangle being given, to find the side of a square inscribed in the triangle, and standing on the base, in the same manner as the parallelogram D E F C, on the base A B, fig. 14.

Prob. 14. Two sides of a triangle, and a line bisecting the included angle being given, to find the length of the base or third side, upon which the bisecting line falls.

Prob. 15. If the hypothenuse of a right-angled triangle be 35, and the side of a square inscribed in it, in the same manner as the parallelogram A D F P, fig. 12, be 12; what are the lengths of the other two sides of the triangle?

Ne paraissez jamais ni plus sage ni plus savant que ceux avec qui vous êtes. Portez votre savoir comme votre montre, dans une poche particulière, que vous ne tirez point, et que vous ne faites point sonner uniquement pour nous faire voir que vous en avez une.—*Lord Chesterfield.*

LESSONS IN ITALIAN GRAMMAR.—No. XLVII.

Venire, to come.

Infinitive Mood.

Simple Tenses.	*Compound Tenses.*
Present: *venire*, to come	Past: *essere venúto*, to have come
Present Gerund: *venéndo*, coming	Past Gerund: *essèndo venúto*, having come
Past Participle: *venúto*, come	

Indicative Mood.

Present.	
Véngo or *végno*, I come	*venímmo*, we came
viéni, thou comest	*veníste*, you came
viéne, he comes	*vénnero* or *veníro*, they came
venídmo or *vegnámo*, we come	Future.
venite, you come	*Verrò*, I shall or will come
véngono or *végnono*, they come	*verrái*, thou wilt come
Imperfect.	*verrà*, he will come
Veníva or *venía*, I was coming	*verrémo*, we will come
venívi, thou wast coming	*verrète*, you will come
veníva or *venía*, he was coming	*verránno*, they will come
venívamo, we were coming	Conditional Present.
venívate, you were coming	*Verréi* or *verría*, I should or would come
venívano, *veníeno*, or *veníano*, they were coming	*verrésti*, thou wouldst come
Indeterminate Preterite.	*verrébbe* or *verría*, he would come
Vénni, I came	*verrémmo*, we would come
veníati, thou camest	*verrèste*, you would come
vénne, he came	*verrébbero*, they would come

Imperative Mood.

[No First Person.]	*venídmo*, let us come
Viéni, come (thou)	*venite*, come (ye or you)
vénga, let him come	*véngano*, let them come

Subjunctive Mood.

Present.	Imperfect.
Che vénga, that I may come	*Che venissi* or *venéssi*, that I might come
che vénga, that thou mayst come	*che venísi*, that thou mightst come
che vénga, that he may come	*che venísse*, that he might come
che venídmo, that we may come	*che venissimo*, that we might come
che veníate, that you may come	*che veníste*, that you might come
che véngano, that they may come	*che venissero*, that they might come

So conjugate—

Addivenire, to become	*Prevenire*, to anticipate
Antivenire, to anticipate	*Provenire*, to derive
Avvenire, to happen	*Rinvenire*, to recover one's senses
Contravvenire, to contravene	*Rivenire*, to return
Convenire, to agree	*Sopravvenire*, to come unexpectedly
Divenire, to become	*Svenire*, to faint away.
Invenire, to find	
Pervenire, to attain	

IMPERSONAL VERBS.

Impersonal verbs are those which have only the third person singular, and whose subject is unknown and cannot be supplied by a noun.

The following are impersonal:—

Baléna, it lightens	*Ghiáccia*, it freezes
Bisógna, it is necessary	*Grándina*, it hails
Dighiáccia, it thaws	*Névica*, it snows
Dilúvia, it rains very hard	*Pióve*, it rains
Tuóna, it thunders.	

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Several other verbs become impersonal. They are as follows:—

Appartiéne, it belongs	*Impórta*, it concerns
Avviéne, it happens	*Léce*, it is permitted
Conviéne, it becomes	*Páre*, it seems
Básta, it suffices	*C' è* or *v' è*, there is

CONJUGATION OF THE IMPERSONAL VERBS.

Piòvere, to rain.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *pióvere*, to rain	Past: *avére piovúto*, to have rained
Present Gerund: *piovéndo*, raining	Past Gerund: *avéndo piovúto*, having rained
Past Participle: *piovúto*, rained	

INDICATIVE MOOD.

Present.	Future.
Piòve, it raine	*Piovrà*, it will rein
Imperfect.	Conditional Present.
Piovéva, it rained	*Piovrébbe*, it would rein
Indeterminate Preterite.	
Piovè, it rained	

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che piòva, that it may rain	*Che piovésse*, that it might rain

Bisognáre, to be necessary.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *bisognáre*, to be necessary	Past: *avére bisognáto*, to have been necessary
Present Gerund: *bisognándo*, it being necessary	Past Gerund: *avéndo bisognáto*, having been necessary
Past Participle: *bisognáto*, been necessary	

INDICATIVE MOOD.

Present.	Future.
Bisógna, it is necessary	*Bisognerà*, it will be necessary
Imperfect.	Conditional Present.
Bisognáva, it was necessary	*Bisognerébbe*, it would be necessary
Indeterminate Preterite.	
Bisognò, it was necessary	

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che bisógni, that it may be necessary	*Che bisognásse*, that it might be necessary

E'sserci or *ésservi*, to be there.

INFINITIVE MOOD.

Simple Tenses.	*Compound Tenses.*
Present: *éssercí* or *ésservi*, to be there	Past: *éssere* or *ésservi státo*, there to have been
Present Gerund: *essendoci* or *essendovi*, being there	Past Gerund: *essendoci* or *essendovi státo*, there having been

INDICATIVE MOOD.

Present.	Future.
C' è or *s' è*, there is	*Ci sarà* or *vi sarà*, there shall or will be
ci sóno or *vi sóno*, there are	*ci saránno* or *vi saránno*, there shall or will be
Imperfect.	Conditional Present.
C' éra or *v' éra*, there was	*Ci sarébbe* or *vi sarébbe*, there would be
c' érano or *s' érano*, there were	*ci sarébbero* or *vi sarébbero*, there would be
Indeterminate Preterite.	
Ci fù or *vi fù*, there was	
ci fúrono or *vi fúrono*, there were	

IMPERATIVE MOOD.

Ci or *vi sia*, or *siaci* or *siavi*, let there be	*Ci* or *vi siano*, or *sianci* or *sianvi*, let there be

SUBJUNCTIVE MOOD.

Present.	Imperfect.
Che ci sia or *vi sia*, that there may be	*Che ci fósse* or *vi fósse*, that there might be
che ci siano or *vi siano*, that there may be	*che ci fóssero* or *vi fóssero*, that there might be

THE PARTICIPLE.

The Participle is a word which possesses the qualities both of the verb and the adjective.

Participles are of three kinds:—Present, Past and Future.

1. The Present Participle terminates in *ándo* or *éndo*; as—

Amándo, loving
Credéndo, believing
Servéndo, serving

2. The Past Participle ends as follows in the regular verbs:

Amáto—a, amáti—e, loved
Credúto—a, credúti—e, believed
Servito—a, serviti—e, served

3. The Participle Future is not so often used. It is as follows:—

Avére ad amáre, éssere per amáre, being about to love
Avére a crédere, éssere per crédere, being about to believe
Avére a servíre, éssere per servíre, being about to serve

The Italians are accustomed to syncopate several past participles of the first conjugation, as may be seen in the following list:—

Acconcio	for	*acconciáto*,	fitted
adórno	,,	*adornáto*	adorned
asciútto	,,	*asciuttáto*	dried
avvézzo	,,	*avvezzáto*	accustomed
cárico	,,	*caricáto*	laden
cérco	,,	*cercáto*	sought for
cómpro	,,	*compráto*	bought
cóncio	,,	*conciáto*	fitted
cásso	,,	*cassáto*	erased
crépo	,,	*crespáto*	curled
désto	,,	*destáto*	awaken
dimêntico	,,	*dimenticáto*	forgotten
férmo	,,	*fermáto*	stopped
gónfio	,,	*gonfiáto*	swelled
guásto	,,	*guastáto*	spoilt
ingómbero	,,	*ingomberáto*	incumbered
ingómbro	,,	*ingombráto*	incumbered
lácero	,,	*lacerato*	torn
líbero	,,	*liberáto*	delivered
mácero	,,	*macerato*	soaked
manifésto	,,	*manifestáto*	manifested
mózzo	,,	*mozzáto*	cut off
nétto	,,	*mettáto*	wiped
nóto	,,	*notáto*	noted
págo	,,	*pagáto*	paid
pésto	,,	*pestáto*	pounded

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privo	for	*privato*	deprived
salvo	,,	*salvato*	saved
sazio	,,	*saziato*	satiated.
scalzo	,,	*scalzato*	bare-footed
scarico	,,	*scaricato*	unloaded
scampo	,,	*scampato*	saved
scémo	,,	*scemato*	lessened
sciocio	,,	*sciociato*	spoiled
sécco	,,	*seccato*	dried
sgómbero	,,	*sgomberato*	disengaged
sgómbro	,,	*sgombrato*	
sporco	,,	*sporcato*	dirtied
stanco	,,	*stancato*	wearied out
stracco	,,	*straccato*	fatigued
tócco	,,	*toccato*	touched
trónco	,,	*troncato*	cut off
trovo	,,	*trovato*	found
vólto	,,	*voltato*	turned
vuóto	,,	*vuotato*	emptied

THE ADVERB.

The Adverb is a word generally joined to a verb, participle, or an adjective, to express some circumstance, quality, degree, or manner of its signification.

FORMATION OF ADVERBS.

Italian adverbs are formed from adjectives in three ways, viz.:—

1. By uniting the substantive *mente* to the feminine of the adjectives ending in *a*; as—

Dótto or *dótta*, learned	*Dottaménte*, learnedly
saggio or *sággia*, wise	*saggiaménte*, wisely
vano or *vana*, vain	*vanaménte*, vainly

2. By adding the substantive *mente* to the adjectives ending in *e* not preceded by *l*; as—

Diligénte, diligent	*Diligenteménte*, diligently
felice, happy	*felicemente*, happily
prudénte, prudent	*prudenteménte*, prudently

3. By joining the substantive *mente* to the adjectives ending in *le* and *re*, which lose their *e*; as—

Fácile, easy	*Facilménte*, easily
mirábile, wonderful	*mirabilmente*, wonderfully
anterióre, previous	*anteriorménte*, previously
particolare, particular	*particolarménte*, particularly

Except—

Málo, bad, which makes *malaménte*, badly.

Adverbs are of different kinds.

Of Time Present.

Ora, adesso, al presénte, at present
Oggi, to-day
In quésto instánte, in questo pónto, in témpo, this moment
Or óra, directly
Quésta máne, questa mattina, sta máne, sta mattina, this morning
Quésta séra, sta séra, this evening
Quésta nótte, sta nótte, to-night
Subito, immediately
Presentemente, presently
In quésto méntre, just now
Présto, quick

Of Time Past.

Anticaménte, prima, anciently
Innánzi, before
Ier l' áltro or *avántieri*, the day before yesterday
Póco fa, a little while ago
Néi témpi andáti, áltre vólte, formerly
Di frésco, recently
E' grand pézzo, è lúnga péza, è mólto, è un pezzo, it is a long time
Ier mattina, yesterday morning
Ier séra, yesterday evening
L'áltro iéri, the day before yesterday
Non è guári, non ha guári, it is not long ago
L'ánno passáto or *scórso*, last year
Il ménse passáto, last month
Ultimaménte, da póco in quá, lately
Fra póco, in brève, shortly

Of Time to Come.

A dománi dúnque, to-morrow then
All avvenire, In future
Domani a ótto, to-morrow week
Dománi a quíndici, to-morrow fortnight
Domán l'áltro, the day after to-morrow
O'ggi a ventídue, three weeks hence
Posdománi, the day after to-morrow
Quánto prima, as soon as possible
L'ánno próssimo, next year
Il ménse ventúro, next month
La settimána próssima, next week
Da quí a dúe mési, in two months time
Il giórno seguénte, the next day
Dománi mattina, domattina, to-morrow morning
D''óra innánzi, henceforward

Of Time Indefinite.

A'lle vólte, sometimes
Al più présto, at the soonest
Di buon' óra, early
Di bel nuóvo, again
Di bótto, suddenly
Di continuo, continually
Di dì in dì, di giórno in giórno, from day to day
Di giórno, by day
Di rádo, seldom
Di quándo in quándo, di témpo in témpo, tratto, tratto, from time to time
Fin adésso, fin a quest' óra, fin óra, hitherto
Fra póco, in a short time
Il più soviénte, oftener
In brève, in brève tempo, shortly
In quel méntre, in the mean time
In tempo, seasonably
In un báttere d' occhio, all of a sudden
In un último, all at once
Per témpo, early
O'gni giórno, every day
Giornalmente, daily
Tardi, late
Sémpre, always
Mái, never
Per sémpre, for ever
Spésso, often
Di già, already
Non ancóra, not yet
Tósto or *présto*, soon
Di nuóvo or *ancóra*, again
Quándo, when
Méntre, whilst
Qualche vólta, sometimes

Of Place.

Dóve, where
Dónde, from whence
Quí or *quá*, here
Lì, là, colà, there
Di dóve, whence
Di lì, là, from thence
Di quí, quá, from hence
Vícino or *appréso*, near
Lúngi or *lontáno*, far
Altróve, somewhere else
Vérso, towards
Innánzi or *avánti*, before
Indiétro, behind
Dappertútto, in ógni párte, every way
Fin dóve, till where
Fuóri, out
Déntro, in
Fin quí, till here
Fin là, till there
Sú in último, di sópra, above or up stairs
Fin a quándo, till when
Sópra, upon
Di sótto, abbásso or *giù*, under or below stairs
Al di là, óltre, beyond
Da ógni dóve, da ógni párte, on all sides
D' intórno, all around
Accánto or *a cánto*, by the side
In dispárte, a párte, da parte, da bánda, aside
In giù, down
In sù, above
Sin dóve, how far
Qui vícino, near here
Di quá, on this side
A déstra, on the right
A sinístra, on the left
Di diétro, from behind
In giro, round about
Quà e là, here and there
Rimpétto, opposite

Of Order.

Prima or *primieraménte*, first
In fíla, in a row
In giro, álla vólta, by turns
Un dópo l'áltro, álla fíla, one after another
Insiéme, together
A úno a úno, one by one
A dúe a dúe, two by two
Dipói, then
In séguito, di séguito, afterwards
Dálle fondaménta, from the foundation
Infine, álla fine, at last
Sopratútto, above all
A'lla rinfúsa, sossópra, topsy turvy
A vicénda, alternately

Of Quantity and Number.

Quánto, how much
Quási, almost
Mólto, much
Tróppo, too much
Un pochettino, but a little
Più, more
Niénte affátto, not at all
Abbondanteménte, abundantly
Ménо, less
Non mólto, not much
Intieraménte, quite
Totalménte, del tutto, entirely
Circa, about
Per metà, by half
Un tantino, a little
Davvantaggio, di vantaggio, di più, some more
Un póco di più, a little more
Présso a póco, near about
Alméno, at least
Abbastánza, enough
Un póco di ménо, a little less
Niénte, nothing
Un po' tróppo, a little too much
Quánte vólte, how many times
Una vólta, once
Tánte vólte, so many times
Dúe vólte, twice
Mólte vólte, several times

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Of Quality and Manner.

Giustaménte, justly
A cavalcióni, a straddle
A cavallo, on horseback
A piédi, on foot
Inginocchióni, upon one's knees
A póco a póco, little by little
Di mala vóglia, unwillingly
A'lla stordíta, at random
Temerariaménte, rashly
Béne, well
Male, badly
Carpóne, upon all fours
Bel béllo, adágio, softly, gently
Per fórza, mal volentiéri, cólle cattíve, against one's will
A caso, by chance
A ménte, by heart
Con frétta, hastily
A spron battúto, full speed
Con árte, artfully
A tentóne, groping along
All' indiétro, backward
Con ragióne, rightly
Cólle buóne, con tútto il cuóre, a bíon grádo, per amóre, willingly
A briglia sciólta, at full speed
A caso pensáta, wilfully
A vísta, in sight
Da parte a párte, da bánda a bánda, through
In dúbbio, in doubt
In sospéso, in suspense
Da sénno, da dovéro, daddovvéro, in good earnest
Fuór di luógo, unseasonably
A dirótte lágrime, bitterly
A próva, in emulation
Sminuratamónte, beyond measure
Agevolménte, easily
Amichevolménte, amicably
Supíno, on one's back
Tacitaménte, silently
Mirabilmente, a maravíglia, admirably
Per il dritto, the right way
Per il rovéscio, the wrong side outward
Accortaménte, sagacemónte, cunningly
Sénza la sapúta, unknowingly
All' improvviso, unawares
Malgrádo mío, in spite of me

Of Affirmation.

Di sícuro, sicuraménte, surely
In verità, in truth
Davvéro, veraménte, truly
Certaménte, di cérto, per cérto, certainly
Affé, in faith
Sí, yes
Sí in verità, yes, indeed
Non v' è dúbbio, non v' ha dubbio, there is no doubt
In coscienza, on my conscience
Senza dúbbio, without doubt
Senza fállo, without fail

Of Negation.

Nó, no or not
Affátto, assolutaménte no, by no means
Mái, never
Del tútto, not at all
Niente affátto, not at all

Of Doubt.

Fórse, perhaps
Potrébbe dársi, it might be
Può dársi, può éssere, it may be

Of Comparison.

Più, more
Ménо, less
Cóme, as or like
Siccóme, as
A guísa, a módo, like
Cosí, so or thus
Via più, vieppiù, vie più, viepiù, assai più, still more
Via ménо, vie ménо, assai ménо, much less
Più tósto, piuttósto, rather

Of Interrogation.

Quánto, how much
Cóme, how
Perchè nó, why not
Perchè, why
Ché, what
Quándo, when
Dóve, where.

LESSONS IN SPANISH.—No. XVII.

LIST OF VERBS WITH IRREGULAR PAST-PARTICIPLES.

Some verbs of those in the preceding list of irregular verbs, and some which are otherwise regular, have the past participle irregularly formed. The following list contains all these verbs with the irregular participle. Those marked R have also their past participle regularly formed. Thus *ingerir*, has both *ingerto* and *ingerido*

Abrir,	abierto.	Desdecirse,	desdicho.
Absolver,	absuelto,	Desenvolver,	desenvuelto.
Anteponer,	antepuesto.	Deshacer,	deshecho.
Antever,	antevisto.	Disolver,	disuelto.
Componer,	compuesto.	Disponer,	dispuesto.
Contradecir,	contradicho.	Elegir,	elegido.
Contrahacer,	contrahecho.	Encubrir,	encubierto,
Cubrir,	cubierto.	Envolver,	envuelto.
Decir,	dicho.	Escribir.	escrito.
Deponer,	depuesto.	Esponer,	espuesto.
Descomponer,	descompuesto.	Hacer,	hecho.
Descubrir,	descubierto.	Imponer,	impuesto.
Imprimer,	impreso.	Rehacer,	rehecho.
Indisponer,	indispuesto.	Reponer,	repuesto.
Ingerir, R	ingerto.	Resolver,	resuelto.
Morir,	muerto.	Rever,	revisto.
Oprimir, R	opreso	Revolver,	revuelto.
Poner,	puesto.	Romper, R	roto.
Predecir,	predicho.	Satisfacer,	satisfecho.
Prender, R	preso.	Sobreponer,	sobrepuesto.
Preponer,	prepuesto.	Suponer,	supuesto.
Presuponer,	presupuesto.	Suprimir, R	supreso.
Prever,	previsto.	Trasponer,	trasnuesto.
Proponer,	propuesto.	Ver,	visto.
Proscribir,	proscrito.	Volver,	vuelto.
Proveer, R	provisto.		

Some participles are used sometimes as verbal adjectives; thus *mirado* means, as a participle, beheld, and as an adjective, considerate; *leído* means, as a participle, read, and as an adjective, book-learned; *partido* means divided, and liberal; *sabido* means known, and well-informed. In all such cases the student will find the word, in his Spanish dictionary, defined as an adjective. He will be able, from the sense of the context, to determine whether to employ it as a participle or adjective, just as in English he would know which is the adjective and which the participle in the sentences, "a known event," and "a person whom he has known."

Some changes have taken place in the verb-ending of the second person plural in all the tenses and conjugations. This anciently had its termination in *des;* as, *amades, amábades, amástedes, amarédes, amédes*, etc., for *amais, amábais, amásteis, amaréis, ameis.*

Soy, doy, voy, sois, caigo, oigo, valgo, supo, hubo, puso, etc., were formerly *so, do, vo, sódes, cayo, oyo, valo, supo, ovo, poso.*

With all modern Spanish writers the guttural *x* is changed into *j;* as, *dijo, dijeron, dijera, produjo, produjeron*, instead of *dixo, dixeron, dixera, produxo, produxeron.* The pronunciation is the same in both cases.

OF THE ADVERB.

Adverbs are either primitive or derivative: the *primitive* being those which are simple or uncompounded of any other word, such as *no*, not; *ya*, already; *hoy*, to-day; *allá*, yonder; and the *derivative*, those that are formed from other words (chiefly adjectives, participles, or other adverbs) by the addition of *mente;* as, *brevemente, confusamente, ciertamente.*

The Spanish language, like the English, contains numerous terms composed of more than one word, and used adverbially, hence called adverbial phrases; as, *por cierto*, for certain; *por lo comun*, in general; *de un modo*, in such manner.

OF THE CONJUNCTION

Conjugations are *simple;* as, *y*, and; *ó*, or; *que*, that; *si*, if; *ni*, nor; *porque*, because; *como*, as; *mas*, but; *pero*, hut: or *conjunctive phrases;* as, *con tal de que*, provided that; *pues que*, since; *paro que*, in order that; *á fin de que*, to the end that.

The conjunction *y* is changed into *é* when it comes before a word beginning with *i* or *hi;* as, *las lenguas Española é Inglesa*, the Spanish and English languages; *madre é hija*, mother and daughter.

The conjunction *ó* is changed into *u* when it comes before a word beginning with *o;* as, *lacre ú oblea*, sealing wax or wafer.

OF THE PREPOSITION.

Prepositions are *simple;* as, *con*, with; *de*, of; and *compound;* as, *á pesar de*, in spite of; *cosa de*, about, the matter of; *para con*, as to; *por entre*, through.

The following list comprehends the principal simple prepositions in Spanish:—

A, to, at, for.	*Entre*, between, among.
Ante, in presence of, before.	*Hácia*, towards.
Antes, before, previous to.	*Hasta*, unto, till.
Con, with.	*Para*, for,
Contra, against, opposite to.	*Por*, by, through, of.
De, of, from.	*Segun*, according to.
Desde, from.	*Sin*, without.
Detras, behind.	*Sobre*, upon, over.
En, in, into, on.	*Tras*, behind.

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Prepositions do not alweys correspond in Spanish and in English; that is, *de* is not always to be translated *of*, or *á* hy *to*, etc.; as,

Los valles abundan de trigo, the valleys abouod with wheat.
Ella pide perdon á Dios, she asks pardon from God.

OF THE INTERJECTION.

Tho interjections aro *simple* and *compound*; as, *¡ah!* oh, *¡chito!* hush; and *¡probre de mi madre!* O my poor mother!

The following list comprehends the principal simpla interjections:—

Ah, ah!
Ay, ah! alas!
Ce, here! go on!
Chito, chiton, hush! silence!
Ea, ha! go on! good!
Ete, see! behold! lo!
Fu, pshaw! fie! tush!
Ha, ah! oh!
He, eh! hist! hark!
Hola, halloo, ho there!
O, oh! ho!
Ta, tate, take care! stop!

OF THE ARTICLE.

The articles are not always employed in Spanish in the same manner as they are in English. The following rules will illustrate this observation.

USE OF THE DEFINITE ARTICLE.

The definite articla is to ba used hefore all common nouns taken in a geoeral eense, and in tha whole extent of their signification; as,

El ódio levanta rencillas, hatrad exeites strife.
La caridad es paciente, charity is patient.
Los hombres son mortales, men are mortal.

Hare *ódio*, *caridad*, and *hombres* are taken in a generel sense, meaning all hatred, all charity, all men.

If the noun ha not taken in a general sense, that is, if tha whole of it be not meant, the article is not used; as,

Hace buen tiempo, it is good weather.
Tiene envidia, he-has envy.

Here *tiempo* end *envidia* are designed to express only soma portion of weather and envy, meaning some good weather, some envy.

The definite article is used before proper names of countries, stetes, and days of the week; as,

La Francia es un hermoso pais, France is a beantiful country.
Juan volverá el Martes, John will-return Tuesday.

If the name of the country, state, or region be preceded hy a preposition, or taka its name from its capital city, the articla is generally omitted; as,

Venécia dabz leyes á los monarcos de Europa, Veniee gave laws to tho monarchs of Enrope.

The definite article is to ha used before numerals indicating the day of the month or the hour of the day; as,

El seis de Enero, the sixth (six) of Jsnuary.
A' las tres de la tarde, at three o'clock in (of) tha afternoon.

Tha definite article is used before noune lodicating the rank, offioe, profession, or titles of persons when they are spoken of (but not when they aro addressed); as,

El General Brown es valiente, Ganeral Brown is brave.
El Señor De Forest tiene dos hijas, Mr. De Forest has two daughters.
La Señora Tranor no es prudente, Mrs. Tranor is not prudent.

The definite article (and not the indefinite, as in English) is used before nonns sigoifying a certain weight, measure, size, qnantity or number, when preceded by the price; as,

A tres duros la libra, at three dollars a (tha) pound.
A dos pesos la vara, at two dollars a (tha) yard.
A razon de diez duros el mes, at (the) rate of ten dollars a (tha) month.
A siete pesos el tomo, et seven dollars a (the) volume.
A tres reales la pieza, et three reals a (the) piece.
A cuatro pesos el par, at four dollars a (the) pair.

Instead of the definite articla, the preposition *por* may be used after the price; thns we can say, *á tres duros la libra*, at three dollars tha yard, or *á tres duros por libra*, et three dollars per yard.

OMISSION OF THE DEFINITE ARTICLE.

The definite article is omitted somatimes in Spanish where it would not he omitted in English, as in tha following cases.

Tha defioite artiela is not used before a noun which denotes relationship or kindred of another noun, when a verb comes between them; as,

Maria es hermana de Juana, Mary is tha sister of Jana.
Pablo es hijo del juez, Paul is the son of-the jndge.

The definite articla is not used before nouns in apposition; as,

Pablo, apóstol de los Gentiles, Paul, the spostle of tha Gentiles.
Ellos pecaron al Señor, esperanza de sus padres, thay sinned against-tha Lord, the hope of their fathers.

Sometimes the article is used before nouns in apposition, when employed in a definite or determinative sensa; as,

En tiempo de Herodes el rey, in time of Herod the king.
El autor del "Espiritu de las Leyes," el célebre Montesquieu, dice, the enthor of the "Spirit of Laws," the celebrated Montesquieu, says.

The definite article is not used before numerical adjectives wheo they denote order or suecession; as,

Tomo segundo, pagina sexto, volume the second, pago the sixth.
Enrique octavo, Henry tha Eighth.

The eardinal numhers (and not the ordinal) ere generally used when the number expressing the order or succession exceeds nine; thus, *Cárlos doce*, "Charles tha Tenth" (literally "Charles Tao"), and not *Cárlos duodécimo; tomo trece*, "volume thirteen," and not *tomo décimotercio*, "voluma thirteenth."

The titles of books, essays, chapters or extracts, and the nemes of periodicals, do not ganerally take tha definite article before them (except when spoken of); as,

Historia de España, the History of Spain.
Gaceta de Lóndres, tha London Gazette.

Tha definito article is not used before the word *casa* (houea) when it means home, nor before nouns or adjectives employed adverbially; as,

Está en casa, he is at home (or io the honse).
En verdad, truly.
En oculto, secretly.

OMISSION OF THE INDEFINITE ARTICLE.

The indefinite articla is omittad in some eases in Spanish in which it would not be in English, as in the followiog cases.

When soma portion of a thing only is meant, and when tha adverb *no* is used in the sense of "not a" (that is, "not any," or "no"), the indefinite article is not generally used; as,

Tiene calentura, he has a fever.
Ella tiene idéa de comer, she has an idea of esting (to eat).
Juan hace ruido, John makes a noise.
El es de génio benigno, he is of a henign disposition.
Ella no tiene marido, she has not a husband.
Jorge no tiene flauto, George has not e flute.
No tenemos cochero, we-heve not a coachman.
No tengo piano, I have not a (no) piano.

Io these eases is meant some fever, some idea, some noise, and some portion of a benign disposition; and the article is not usad in Spanish.

The indefinite article is not used hefora two nouns, one of which, being connected hy o verb to tha other, shows the

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nation, relationship, rank, office, profession or vocation of the latter; as,

Juan es Frances, John is a Frenchman.
Señor Kent es juez, Mr. Kent is a judge.
Cárlos es impresor, Charles is a printer.
Halló en él padre y madre, he found in him a father and a mother.

The indefinite article is not used before a noun in apposition with another; as,

Estéban, hombre lleno de fé. | Stephen, a man full of faith.

The indefinite article is not used in the title of a book, chapter, or essay; as,

Coleccion de los mejores Autores Españoles, A Selection of | the best Spanish Authors.

The indefinite article is not used before a noun in an ejaculatory phrase; as,

¡ Que idea ! *¡ Que desgrácia!* what an idea! what a misfortune!

The indefinite article is not used between an adjective and its noun; as,

Médio peso, half a dollar.
En tal tiempo, in such a time.
Tan *hermosa hija*, so beautiful a daughter.

The indefinite article is not used before the words *médio*, a half; *cien* or *ciento*, a hundred; and *mil*, a thousand; as,

Tres años y médio, three years and a half.
Cien hombres, a hundred men.
Dia y médio, a day and a half.

The indefinite article is not used after *algo*, something, or *nada*, nothing, followed by the preposition *de*; as,

Pedro tiene algo de poeta, Peter is something of a poet.

OTHER USES AND OMISSIONS OF ARTICLES.

The indefinite article can be used before (but not after) *tal*, "such;" as,

Tenemos un tal Pontífice, we have a such High-Priest.

The infinitive mood, being used in Spanish as a noun with a preposition before it, in the same manner that the present participle is in English, can take the masculine definite article before it; as,

El murmurar de las fuentes, the murmuring of the fountains.
Al ver el árbol, on seeing the tree.

The definite article is used before the adverbs *mas*, more, and *ménos*, less, to express the superlative degree of comparison; as,

María es la mas hermosa de las mugeres, Mary is the most beautiful of the woman.

The article is generally to be repeated before nouns which immediately follow each other, especially if they do not agree in gender; as,

La prudencia y el valor del rey, the prudence and the valour of the king.

The learner will find many exceptions to the above rule in the best Spanish writers. The article must always be repeated in such cases when each noun is designed to be emphatic. When the word *todo*, all, sums up the several nouns, the article is not generally used before any of the nouns; as, *Españoles, Franceses, Ingleses, y Americanos, todos son mortales*, Spaniards, Frenchmen, Englishmen, and Americans, all are mortal.

The article is omitted in Spanish, as in English, before nouns taken in a partitive sense; as,

El carpintero tiene dinero, the carpenter has money.

In the above example, it is meant that the carpenter has a portion of money, or some money. When the word *some* is to be expressed, *algun* in the singular, and *algunos* or *unos* in the plural, is used; as *algun idea*, some idea; *alguna caverna*, some cavern; *algunos libros*, some books; *unas señoras*, some ladies.

Before a singular noun, denoting something to eat or drink, the word some is expressed in Spanish by *un poco de*, a little of; as, *déme un poco de leche*, give me some milk.

When in English some or any is used before a singular noun in an interrogative or negative sentence, in Spanish it is usually omitted, especially before nouns meaning something to eat or drink; as, *¿ toma vmd. azúcar ?* do you take any sugar? *¿ tiene vmd. tazas ?* have you any cups? *¿ tiene vmd. algunos platillos ?* have you any saucers? *no tengo flauta*, I have not any flute; *no tiene hacha*, he has not any axe.

OF THE NOUN.

AUGMENTATIVES, DIMINUTIVES, AND COMMON TITLES OF RESPECT.

Augmentative nouns are such as are increased, in the extent of their signification, by the terminations *on, ona, azo, aza, ote;* thus the words *daga*, dagger; *cuchara*, spoon; *fraile*, friar; *gato*, cat; *manga*, sleeve; *mugar*, woman; *frente*, forehead, can be rendered augmentative: as *dagon*, large dagger; *cucharon*, large spoon, i.e. a ladle; *frailon*, large friar; *gatazo*, large cat; *mangote*, large sleeve; *mugerona*, large woman; *frentaza*, broad forehead.

Diminutive nouns are such as are decreased, in the signification of their primitives, by the terminations *ico, ica, ejo, eja, ito, ita, eto, eta, illo, illa, uelo, uela;* thus, *fraile*, friar; *capilla*, chapel; *cuchara*, spoon; *batel*, boat, can be rendered diminutive; as, *frailecico, frailecito, frailezuelo*, a little friar; *capilleja, capillita, capilleta*, small chapel; *cucharica, cucharita, cucharcta, cucharillo*, small spoon; *batelico, batelejo, batelito, batelillo*, little boat. The terminations *uelo* generally, and *illo* also sometimes, express contempt; as *hombre*, man; *hombrezuelo* or *hombrecillo*, an insignificant or contemptible little fellow.

Adjectives are also frequently found used in a diminutive sense; as, *poco*, little; *poquillo, poquítico, poquito*, very little.

There is also a kind of nouns composed of the name of some instrument or object and one of the terminations *azo, aza, ada*, the compound word including in its meaning both the instrument and some effect produced by it; as, *dardo*, a dart, *dardada*, a blow given with a dart; *cuchara*, a spoon, *cucharazo*, a blow with a spoon; *pluma*, a pen, *plumada*, a dash or stroke with a pen; *mano*, the hand, *manotazo* or *manotado*, a blow with the hand; *aldaba*, a knocker, *aldabada*, a rap with the knocker, and *aldabazo*, a violent rap with the knocker.

When a noun with a singular termination denotes several persons or things, it is called a *collective* noun, or noun of multitude; as, *turba*, a crowd; *vacada*, a drove of cows.

The ordinary titles of respect corresponding to Mr. or Esq. in English are in Spanish *Señor* and *Don;* and those corresponding to Madam and Mrs. are *Señora* and *Doña;* and Miss, *Señorita*. *Don* and *Doña* never take the article before them, and can be used before Christian names only. *Señor* and *Don* are often used together before the Christian name. The following examples will show the manner in which these words are used:

El Señor Blake es Americano, Mr. Blake is an American.
Don Diego Ticknor, me alegro mucho de verle, Mr. James Ticknor, I am very glad to see you.
El Señor Ray; La Señora Ray, Mr. Ray; Mrs. Ray.
El Señor Cárlos Mason, Master Charles Mason.
La Señorita Mason, Miss Mason.
Al Señor Don Diego Harper, to James Harper, Esq.
Al Senor Juan Harper, to Mr. John Harper.
Los Señores Don Juan Millon y Don Pablo Surret, Messrs. John Millon and Paul Surret.
Los Señores Riggs y Tiggs, Messrs. Riggs and Tiggs.
Da una silla á Doña Sarah Ray, give a chair to Mrs. Sarah Ray.

The article is never used before these titles, except when the persons are spoken of; of course, when persons are addressed, the proper title only is used; as,

Buenas tardes tenga vmd., Señorita Wilson, I wish you a good evening, Miss Wilson

Señor, señora, señorita, señores, señoras, señoritas, also are used for sir, madam, miss, gentlemen, ladies, young ladies, respectively: as,

Buenos dias, señor, good morning, sir. | *Buenas noches, señores*, good night, gentlemen.

Señor and *señora* are used as an additional mark of respect before the name of a relative in such cases as the following:

¿ Como está su señor hermano ? how is your brother ? | *¿ Como está su señora madre ?* how is your mother ?

OF THE ADJECTIVE.

AGREEMENT AND POSITION OF ADJECTIVES.

The adjective must always agree in gender and number with the noun to which it belongs; as,

El hombre sábio, the wise man. | *Los hombres sábios*, the wise men.
La muger sábia, the wise woman. | *Las mugeres sábias*, the wise women.

Participles used as adjectives agree in gender and number with the noun to which they belong; as,

El engañado rey, the deluded king. | *La engañada reina*, the deluded queen.
Las engañadas criadas, the deluded female servants.

An adjective does not agree with the gender of the title of a person, but with the gender of the person to whom it is applied; as,

Su majestad está enferma, his majesty is ill. | *Su majestad está enferma*, her majesty is ill.

Nada, nothing, requires a masculine adjective; as,

Nada hay limpio, there is nothing pure.

Two or more nouns in the singular require the adjective which belongs to them to be in the plural, and if the nouns are of different genders, the adjective must be in the masculine; as,

Juana y María están calladas, Jane and Mary are silent. | *Lucía y Cárlos están cansados*, Lucy and Charles are tired.

When an adjective comes before or after two or more plural nouns of different genders, it must agree in gender with the noun nearest to it; as,

Buenos diccionários y gramáticas, good dictionaries and grammars. | *Diccionários y gramáticas buenas*, good dictionaries and grammars.

The Spanish Academy recommends that, in cases in which an adjective is to be used with two or more nouns differing in gender and number, it would be better to use a different adjective of similar meaning for every noun, or an adjective which does not change its ending to form its feminine for the plural.

The material of which a thing is made, as well as the country in which it is made or produced, are seldom used as adjectives, but as a noun preceded by the preposition *de*; thus,

Paño de lana, woollen cloth. | *Hoja de plata*, silver leaf.
Cuero de Méjico, Mexican hides. | *Cerveza de Lóndres*, London beer.

The profession or dignity of a person may be qualified by an adjective derived from the name of a nation preceded by the preposition, as above; thus,

General Mejicano, Mexican general. | *General de España*, Spanish general (general of Spain).

The title of the chief ruler of a country is not qualified by an adjective expressing the nation, but by the name of the country, preceded by the preposition; as,

El rey de España, the king of Spain. | *La reina de Inglaterra*, the queen of England.
El presidente de los Estados Unidos, the president of the United States.

Adjectives of both numbers and genders are often used as nouns, being in such cases preceded by the article; as,

Un rico, a rich (man). | *Los ricos*, the rich (men).
Una rica, a rich (woman), | *Los ricas*, the rich (women).
Los doctos, the learned.

The neuter article (as it is called) *lo*, precedes adjectives in the singular number, used as nouns, when taken in a general sense, without reference to either gender; as,

Lo escrito, the written, i.e. that which is written. | *Lo malo*, the bad, *i.e.* that which is bad.
Lo siguente, the following, *i.e.* that which follows.

Adjectives and participial adjectives are much oftener placed after the noun to which they belong than before it; as,

Hombre sábio, a wise man. | *Guárdia avanzada*, advanced guard.
Furor poético, poetical fury.

In many cases it is left entirely to the taste of the writer to place the adjective before or after the noun to which it belongs. But cardinal numbers, adjectives expressing some inherent or peculiar property, habit, or practice of the noun to which they belong, and adjectives employed as particular epithets with a proper name, are generally placed before the noun: so likewise adjectives accented on the antepenult; as,

Una dulce frescura, a pleasant coolness. | *La blanca nieve*, the white snow.
Cristalina água, crystalline water. | *La tímida oveja*, the timid sheep.
El ambicioso Jefferson, the ambitious Jefferson.

The above rule is liable to many exceptions. Indeed, no certain rules can be given for the position of adjectives. Attention on the part of the pupil to the practice of the best Castilian writers will prove the best means of teaching him the most proper arrangement for adjectives.*

Tanto, as much; *cuanto*, so much; *mucho*, much; *todo*, all; *poco*, little; are always placed before the noun.

In some few cases the same adjective has a different meaning, according as it is placed before or after the noun; as,

Cierta señora, a certain lady.
Cuenta cierta, a true (certain) narrative.

ANSWERS TO CORRESPONDENTS.

G. H. H. D.—You will get the information you require in any good work recently published on Chemistry.

J. B.—The equator is an imaginary line round the earth—the circle through which the sun appears to move; and on the arrival of the sun at which, the day and night become equal; on which account it is sometimes called the equinoctial line.

A SUBSCRIBER FROM THE FIRST.—"The dress of the Blue-coat boys," says Mr. Timbs, "is the costume of the ancient citizens of London at the time of the foundation of the Hospital, when blue coats were the common habits of the apprentices and serving-men, and yellow stockings were generally worn. This dress is the nearest approach to the monkish costume now worn; the dark blue coat, with a closely-fitting body and loose sleeves, being the ancient tunic; and the under coat, or 'yellow,' the sleeveless under tunic of the monastery. The red leathern girdle corresponds to the hempen cord of the friar. Yellow worsted stockings, a flat black woollen cap (scarcely larger than a saucer), and a clerical neck-band, complete the dress."

* The adjective is sometimes used after the noun in English; as, an account current; the tie matrimonial; life everlasting; a noun common; a verb active; page thirtieth.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXXIII.

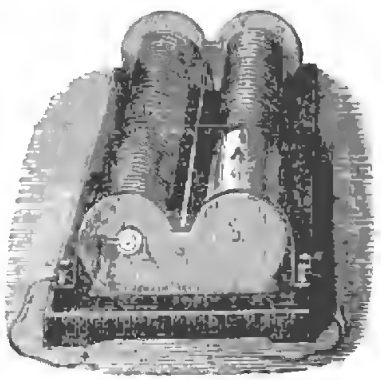
(*Continued from page 306*)

DYNAMICAL ELECTRICITY.

GENERAL LAWS AND VELOCITY OF ELECTRICAL CURRENTS.

The Rheostat.—This apparatus serves to increase or diminish the length of the circuit traversed by a current, in such a way as to make it produce a definite amount of deflection in the galvanometer. It is the invention of Wollaston, and consists of two parallel cylinders, one A of brass, and the other B of wood, fig. 479. The wooden one has a wooden groove all

Fig. 479.



along, and terminates at *a* in a copper ring, to which is attached the end of a brass wire. This wire, which is 150 feet long, is wound more or less in the groove, and passes over to the cylinder A, and after being rolled many times round A, is fastened at its extremity *c*. Lastly, of the two adjusting screws *m* and *o*, which keep the conductors of the current that we wish to observe fixed, one is connected by means of a strip of steel with the copper cylinder A, and the other with the ring *a*.

When a current enters at *o*, it traverses only that part of the wire wound round the cylinder B, in which the spirals are isolated by the groove, but when once it has reached the cylinder A, which is metallic and in contact with the wire, the current passes from *m* to *n*. Consequently, if we wish to increase the length of the circuit, we have only to turn the winch *d* from right to left. If, on the contrary, we wish to diminish it, we put the winch upon the axis *e*, and then, turning it from left to right, wind the wire upon the cylinder A. We may thus diminish or increase the intensity of the current at pleasure, for, as will be shown presently, this intensity is in inverse proportion to the length of the circuit. With regard to the length of the circuit, it is indicated by two needles which are not visible in the figure, but are moved by the cylinders A and B when they turn together.

The Sine Compass is a galvanometer intended to measure the intensity of currents, without having recourse to a table of graduation. This apparatus, which was invented by M. Pouillet, differs from the galvanometer described in a previous lesson in several respects. In the first place, the copper wire along which the current passes is wound only a very few times round the magnetised needle, sometimes only once. Further, the dial, about which the wire is wound, is moveable about a vertical axis upon a fixed horizontal circle, which serves to indicate the displacement of the dial. The galvanometrical circuit being placed in the magnetic meridian, and consequently in the same plane as the needle, the current is passed. The needle being deflected, turn the circuit till it coincides with the vertical plane passing through the magnetised needle. At this moment, the directive action of the current being exerted perpendicularly to the direction of the magnetised needle, it is demonstrated by mathematical investigation that the intensity of the current is proportional to the sine of the angle of deflection of the needle. Consequently, the angle of deflection being known, and therefore also its sine, the intensity of the current may be deduced.

Laws of the Intensity of Currents.—Currents *of the same intensity* are those which in the same circumstances produce the same deflection in the same magnetised needle. A great many philosophers—among whom Messrs. Ohm, Pouillet, Faraday, Fechner, and De la Rive may be particularly mentioned—have endeavoured to compare the intensities of electrical currents arising from different sources. These researches, which have been carried on by means of the galvanometer, the sine compass, and the rheostat, have led to the establishment of the same laws for thermo-electrical currents as for hydro-electrical currents. Only in the case of the former we neglect the directive influence of the battery, because, being metallic and of small dimensions, its resistance may be disregarded. But this is not the case with hydro-electrical currents, in reference to which it is necessary to take into account the resistance of the battery. M. Pouillet accomplishes this object by adding to the length of the interpolated wire, that length of wire which by its resistance would produce upon the current the same diminution of the intensity as the battery itself produces by its feeble conductibility. The circuit being entirely metallic, which is then supposed to be traversed by the current, is called by M. Pouillet the *reduced current*.

The following are the different laws observed by electrical currents, whatever be the nature of the source from which they are derived.

1. The intensity of a current is directly proportional to the sum of the electro-motive forces which are in operation in the circuit; understanding by electro-motive force the cause, whatever it may be, which produces a liberation of dynamical electricity.

2. The intensity is the same at all points of the circuit.

3. The intensity is in inverse proportion to the *reduced* length of all the parts of the circuit.

4. The intensity is in direct proportion to the thickness and conductibility of the wire along which the current passes.

It follows from the last two laws, that the intensity remains the same when the thickness of the wire is always in the same ratio to its length.

M. Pouillet found that in liquids, as well as solids, the intensity of the current is in direct proportion to the thickness of the liquid column along which the current passes, and in inverse proportion to its length, provided the length is at least five or six times that of the diameter of the column.

Conductibility of Hydro-Electrical Currents.—The conducting power of bodies in reference to hydro-electrical currents varies with the force of the currents, and with the different conductors which the currents have already passed through. Indeed, M. De la Rive has discovered that currents pass through metallic plates and liquids with greater ease in proportion to the number through which they have already passed.

By means of the voltameter, Sir Humphrey Davy found that the conductibility of the same metal is directly proportional to the thickness of the wire and inversely proportional to its length. M. Becquerel has verified the truth of this law by means of a galvanometer with two wires. With regard to the electric conductibility of different metals, M. Ed. Becquerel found that at freezing point their relative conducting powers may be represented by the following numbers:—Silver, 100; copper, 91·5; gold, 64·9; zinc, 24; tin, 14; iron, 12·3; lead, 8·3; platinum, 7·9; mercury, 1·739.

On comparing together the conducting powers of different liquids, and taking that of distilled water as unity, M. Pouillet arrived at the following results:—Water containing $\frac{1}{5000}$ of nitric acid, 6; water saturated with sulphate of zinc, 167; water saturated with sulphate of copper, 400. With regard to the ratio between the conductibility of metals and that of liquids, the latter is much more feeble, for, according to M. Pouillet, copper conducts sixteen million times better than saturated solution of sulphate of copper, which is six thousand four hundred million times better than distilled water.

Lastly, it has been found that the elevation of the temperature increases the conducting power of liquids, while the contrary takes place with solids.

Velocity of Electricity.—Numerous attempts have been made to determine the velocity of the propagation of electricity along

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metallic wires. In 1834, Professor Wheatstone made use of a revolving mirror like that already described in connexion with the velocity of light, fig. 248. From the delay, in a given time, of the image of a spark produced by the Leyden jar when electricity was passing through a long wire, the professor found that, along a brass wire about one-twelfth of an inch in diameter, electricity is transmitted with a velocity of more than two hundred and eighty-five thousand miles in a second, which is more than half as great again as that of light. Mr. Walker, in America, having made investigations upon the same subject in 1849, by means of signals transmitted along electric telegraph wires, found that the velocity of electricity was only about eighteen thousand miles in a second, which is about one-fifteenth of the above.

In 1850 Messrs. Fizeau and Gounelle, by experiments on the telegraphic wires from Paris to Amiens and to Rouen, arrived at the following results:—

1. Along a wire about one-sixth of an inch in diameter electricity is transmitted with a velocity of more than sixty-three thousand miles in a second.

2. Along a wire about one-tenth of an inch in diameter, the velocity was found to be upwards of one hundred and ten thousand miles in a second.

3. Both kinds of electricity, the positive and negative, are transmitted with the same velocity.

4. The number and nature of the elements of which the battery is formed—and consequently the tension of the electricity and the intensity of the current—have no influence upon the velocity of transmission.

5. In conductors of different substances, the velocities are not proportional to their electrical conductibility.

ANIMAL ELECTRICITY.

Electrical fishes are those which possess the remarkable property of communicating to one who touches them a shock like that produced by a Leyden jar. There are several species of such fish: the torpedo, the gymnotus or electrical eel, and the silurus. The torpedo, which is very common in the Mediterranean, has been studied with great care by Messrs. Becquerel and Breschet in France, and M. Matteucci in Italy. The electrical eel has been studied by Messrs. Humboldt and Bompland in South America, and Professor Faraday in this country, who made his observations upon living specimens.

The shock communicated by electrical fishes serves them as an offensive and defensive weapon. It is entirely voluntary on their part, and becomes gradually weaker the oftener it is repeated and in proportion as the fish lose their vital power, for the electrical action soon produces great exhaustion in them.

The shock is often very violent. According to Mr. Faraday, the shock communicated by the electrical eel is equivalent to that of an electric battery of 15 jars, the total surface of the armatures being three square feet, which explains how it is that horses are sometimes overpowered by repeated shocks from electrical eels.

Several experiments prove that the shocks do really result from ordinary electricity. Indeed, if, while touching the back of the fish with one hand, you touch the belly with the other, or with a metallic rod, you will feel a violent shock in the hands and arms, while if you touch it with an isolating body there is no shock at all. Further, when you connect one end of the wire of the galvanometer with the back of the fish and the other with the belly, you will see that at each discharge the needle is deflected and immediately returns to zero, which shows that there is an instantaneous current; the direction of the deflection also indicates that the current goes from the back to the belly of the fish. Lastly, if you pass the current of a torpedo along a helix with a small steel bar at the centre, fig. 452, the bar will be magnetised by the passage of the discharge.

By means of the galvanometer M. Matteucci has established the following facts:—

1. When a torpedo is lively and vigorous, it is capable of giving a shock at any part of its body; but in proportion as its vitality is exhausted, the points at which it is capable of giving a shock approach nearer and nearer the organ which serves as the seat of the development of electricity.

2. Any point whatever of the back is always positive in relation to the corresponding point in the belly.

3. Of two points situated at unequal distances from the electric organ, the nearer always performs the part of the positive pole and the more distant that of the negative pole. The reverse of this is the case with the belly.

With regard to the organ in which the electricity originates in the torpedo, it is double, and formed of two parts symmetrically situated on the two sides of the head, and attached to the bones of the skull on their internal surface. These two parts unite in front of the nose, but are separated from the skin. According to M. Matteucci, each of these organs is formed of a large number of prismatic masses placed side by side, and extending from the external to the internal surface in such a manner that their section perpendicular to the edges of the prisms presents the appearance of honey-comb cells. These prisms are divided perpendicularly to their edges by a series of diaphragms forming a row of small vesicles of the same kind, and filled with nine parts of water for one of albumen, and a little sea-salt.

M. Matteucci, relying upon the following experiment, regards each of these vesicles as the elementary organ of the electrical apparatus. He took from the organs of a living frog, a mass of these vesicles about the size of a pin's head, and put it in contact with the nerves of a dead frog prepared after the manner of Galvani, fig. 417. He then observed that when he excited this vesicular mass by pricking it with any pointed substance, contractions took place in the dead frog.

M. Matteucci also endeavoured to trace out the influence of the brain upon the discharge. For this purpose, he stripped bare the brain of a living torpedo, and observed that the first three lobes might be irritated without any discharge, and that if they were removed, the fish still retained the power of giving a shock. The fourth lobe, on the contrary, cannot be irritated without a discharge being instantly produced; and if it is taken away, all indication of electricity disappears, even though the other lobes remain intact. We are therefore led to believe that the original source of the electricity is the fourth lobe, whence it is transmitted by means of nerves to the two organs above described, which act as multipliers. In other electrical fishes, also, it is the brain which appears to be the original source of electricity.

Considering the large quantity of electricity discharged by some fish, certain philosophers have inquired whether there may not be a similar elaboration of electricity in other fish and animals, not perhaps sufficient to give shocks like those of the Leyden jar, but still enough to produce gentle action and perform the functions essential to life, such as digestion, secretion, etc. There seems much to favour the supposition, but at present it is not sufficiently confirmed by experiment to be any thing more than a probable supposition.

BIOGRAPHY.—No. XXIV.

SARAH MARGARET FULLER.

This remarkable woman was the daughter of Timothy Fuller, a member of the Boston bar, but a resident of Cambridge, Massachusetts, where Margaret was born. From 1817 until 1825, Mr. Fuller was sent to Congress, representative of the district of Middlesex. At the close of these political duties, he retired from his profession, and settled in the country as an agriculturist; soon afterwards he died.

Margaret was the oldest child of the family, and at an early age evinced remarkable aptitude for study. It became her father's pride and pleasure to cultivate her intellect to the utmost degree. We are told that his tasks were often oppressive, and thus her juvenile brain was taxed to the disadvantage of her physical healthy development. Most particularly did the father instruct his daughter in the learning he considered of the first importance—the classic tongues. An acquaintance with these subsequently led her to study the modern languages; and Miss Fuller was, from her youth, distinguished for her extraordinary philological acquirements. Of course, the German literature exerted a potent sway over her taste and genius—

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such influence being now-a-days too common with both adepts and dabblers in learning to excite wonder.

Miss Fuller was, however, besides her classical studies, most thoroughly exercised in every solid and elegant department of literature, and probably no American woman was ever before so fully *educated*, as that term is usually applied. After her father's decease, she devoted her talents and acquirements to the assistance of her mother and sisters, by opening classes for the instruction of ladies, both single and married, first in Boston, then in Providence, Rhode Island, and afterwards in Boston again. During this period, her womanly characteristics—self-sacrificing generosity, industry, untiring kindness in the domestic circle—were beautifully displayed.

Her memory is more sanctified by the love of her exemplary qualities called forth in the privacy of home, than by all the literary laurels her admirers wish to offer her.

In 1839, she made a translation of Goëthe's "Conversations." This was her first work. She was, in the following year, concerned with Ralph Waldo Emerson in editing the "Dial," a periodical of some note in its day, to which both these writers contributed essays, highly applauded by their transcendental readers. To those who require perspicuity as a condition of excellence in literature, such "wanderings round about a meaning," however fine may be the diction, are never appreciated; yet it is but fair to say, that the meaning of Miss Fuller was always honest and generous. She was so far from being in adoration before herself, that she seemed ever aiming to enlarge the moral good of her "brother man and sister woman."

In 1843, she published a volume, "Summer on the Lakes," being an account of a tour to Illinois. This book contains, with irrelevant matter, some sensible remarks, but there is little in it, as far as regards style or story, beyond what might be found in the letters of any well-educated gentlewoman of moderate abilities, who thought it worth while to journalise on a summer's ramble. About this period, Miss Fuller resided for a time in New York, where she edited the literary department of the "Tribune," contributing papers on various subjects, but chiefly critical notices of the works of distinguished authors, for which task both education and genius seemed peculiarly to fit her.

In 1845, her most important work, "Woman in the Nineteenth Century," was published in New York. It is evident that a strong wish to benefit her own sex moved her heart and guided her pen. One male critic, whose title of reverend should have inspired more charity, has flippantly remarked, that Miss Fuller wrote because she was vexed at not being a man. Not so. Though discontented with her woman's lot, she does not seek to put aside any duty, or lower the standard of virtue in order to escape the real or imagined evils in her position. Nor was it for herself she sought freedom; she wanted a wider field of usefulness for her sex, and unfortunately for her own happiness, which would have been secured by advancing that of others, she mistook the right path of progress. With her views we are far from coinciding: she abandoned the only safe guide in her search for truth. Whatever be the genius or intellectual vigour possessed by a woman, these avail nothing without that moral strength which is nowhere to be obtained save from the aid God has given us in his revealed Word. Experience and observation prove, that the greater the intellectual force, the greater and more fatal the errors into which women fall who wander from the Rock of Salvation—Christ the Saviour, who, "made of a woman," is peculiarly the stay and support of the sex.

But, though Miss Fuller's theories led to mazes and wanderings, her mind was honest in its search for truth; and with much that is visionary and impracticable, "Woman in the Nineteenth Century" contains many useful hints and noble sentiments.

In 1844, a selection from her contributions to various periodicals was issued under the title of "Papers on Literature and Art," a work much admired by those who profess to understand the new thoughts, or new modes of expressing old apothegms, which the transcendental philosophy has introduced. It was her last published work. In the summer of 1845, Miss Fuller accompanied some dear friends to Europe; after visiting England, Scotland, France, and passing through Italy to Rome, they spent the ensuing winter in the "Eternal City," where she continued, while her friends returned to America. In the following year, Miss Fuller was married, in Rome, to Giovanni, Marquis d'Ossoli, an Italian. She remained in Rome till the summer of 1849, when, after the surrender of that city to the French, the Marquis d'Ossoli and his wife, having taken an active part in the republican movement, considered it necessary to emigrate. They went to Florence, and remained there till June, 1850, when they determined to go to the United States, and accordingly embarked at Leghorn, on board the brig "Elizabeth," bound for New York. The deplorable and melancholy catastrophe is well known: the ship, as she neared the American shore, encountered a fearful storm, and on the morning of the 8th of August was wrecked on Fire Island, south of Long Island, and the d'Ossoli family—husband, wife, infant son, and nurse—all perished!

Margaret Fuller, or the Marchioness d'Ossoli, possessed, among a host of professed admirers, many grateful, loving friends, to whom her sad untimely death was a bitter grief. These mourn also that she left her mission unfinished, because they believe a work she had prepared, "On the Revolution in Italy" (the MS. was lost with her), would give her enduring fame. One indication of considerable mental change she exhibited—her enthusiasm for Goëthe had abated, and a friend of hers, a distinguished scholar, asserts, that "with the reformers of the Transcendental School she had no communion, nor scarcely a point in common." Whatever she might have done, we are constrained to add, that, of the books she has left, we do not believe that they are destined to hold a high place in female literature. There is no true moral life in them. The simple "Prose Hymns for Children" of Mrs. Barbauld, or the "Poems" of Jane Taylor, will have a place in the hearts and homes of the Anglo-Saxon race as long as our language endures, but the genius of Margaret Fuller will live only while the tender remembrance of personal friendship shall hold it dear. Her fame, like that of a great actor or singer, was dependent on her living presence—gained more by her conversational powers than by her writings. Those who enjoyed her society, declare that her mind shone most brightly in collision with other minds, and that no adequate idea of her talent can be formed by those who never heard her talk. This was also true of Coleridge; and Dr. Johnson is certainly a greater man in "Boswell's Life" than in the "Rambler." Margaret Fuller had no Boswell.

THEORY AND PRACTICE OF TEACHING.
No. III.

LITERARY QUALIFICATIONS OF THE TEACHER.

We are now about to enter an extensive field. Since the teacher is to be the life of the school, it is of great consequence that he have within him the means of sustaining life.

The profession of teaching is advancing. The present standard of acquirement demanded of the teacher excludes many who were considered quite respectable in their vocation ten years ago. This may well be so; for within that time, quite an advance has been made in the compensation offered to teachers. It is but reasonable that acquirement should keep pace with the reward of it. Indeed, the talent and attainment brought into the field must always be in advance of the rate of compensation. The people must be first convinced that teachers are better than they were years ago, and then they will be ready to reward them. Their system of supervision has increased in strictness, during this time, in an equal ratio; and many teachers who were entirely incompetent for their places, have thus been driven to other employments. The cause is still onward; and the time is not far distant when the people will demand still more thorough teachers for the common schools, and they will find it for their interest to pay for them.

Under these circumstances, it will not be our design to give the very lowest qualifications for a teacher at present. We shall aim to describe those which a teacher *ought to possess*, in order to command for some time to come the respect of the

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enlightened part of the community. We will not say that a man, with less attainment, than we shall describe, may not keep a good school; we have no doubt that many do. Yet if the profession is to be really respectable, and truly deserving of the regard of an enlightened people, we must have a still higher standard of qualification than we shall now insist on. The following is a list of the studies of which every teacher *should have* a competent knowledge. We add also to each such word of comment as appears to be necessary.

1. Orthography.—This implies something more than mere *spelling*. Spelling is certainly indispensable. No person should ever think of teaching who is not an accurate speller. But the *nature* and *powers* of letters should also be mastered. We have in our language about forty elementary sounds; yet we have but twenty-six characters to represent them. Our alphabet is therefore imperfect. This imperfection is augmented by the fact that several of the letters are employed each to represent several different sounds. In other cases, two letters combined represent the element. There are also letters, as *c*, *q*, and *x*, which have no sound that is not fully represented by other letters. Then a very large number of our letters are silent in certain positions, while they are fully sounded in others. It were much to be desired that we might have a *perfect* alphabet, that is, as many characters as we have elementary sounds, and that each letter should have but one sound. For the present this cannot be; and the present generation of teachers, at least, will have to teach our present orthography. Those systems of orthography are much to be preferred which begin with the *elementary sounds*, and then present the letters as their representatives, together with the practice of analysing words into their elements, thus showing at once the silent letters and the *equivalents*. These systems may be taught in half the time that the old systems can be; and when acquired, they are of much greater practical utility to the learner.

2. Reading.—Every teacher should be a good reader. Not more than one in every hundred among teachers can now be called a good reader. To be able to read well, implies a quick perception of the meaning as well as a proper enunciation of the words. It is a branch but poorly taught in most of our schools. Many of the older pupils get *above* reading before they have learned to read well; and, unfortunately, many of our teachers cannot awaken an interest in the subject, because very likely they cannot read any better than their scholars.

It would be interesting to ascertain how large a proportion of our youth leave the schools without acquiring the power readily to *take the sense* of any common paragraph which they may attempt to read. In this way we account for the fact that so many cease to read as soon as they leave school. It costs them so much *effort* to decipher the meaning of a book, that it counteracts the desire for the gratification and improvement it might otherwise afford. It should not be so. The teacher should be a model of good reading; he should be enthusiastic in this branch, and never rest till he has excited the proper interest in it among the pupils, from the oldest to the youngest in the school.

It would be well if our teachers could be somewhat acquainted with the Latin and Greek languages, as this would afford them great facilities in comprehending and defining many of our own words. As this cannot be expected for the present, a substitute may be sought in some analysis of our derivative words. Several works have somewhat recently been prepared, to supply, as far as may be, the wants of those who have not studied the classics. We should advise every teacher, for his own benefit, to master some one of these.

3. Writing.—It is not respectable for the teacher of the young to be a bad writer; nor can it ever become so, even should the majority of bad writers continue to increase. The teacher should take great pains to write a plain, legible hand. This is an essential qualification.

4. Geography.—A knowledge of the principles of geography is essential. This implies an acquaintance with the use of globes, and the art of map-drawing. The teacher should be so well versed in geography, that with an outline map of any country before him, he could give an intelligent account of its surface, people, resources, history, etc.; and if the outline map were not at hand, he ought to be able to draw one from memory,—at least, of each of the grand divisions of the earth.

5. History.—The teacher should be acquainted with history,—at least, the history of his own country. He can hardly teach geography successfully without a competent knowledge of both ancient and modern history. It should, in the main, be taught in our common schools in connection with geography.

6. Mental Arithmetic.—Let every teacher be thoroughly versed in some good work on this subject. Cassell's is probably the best that has been prepared. It is not enough that the teacher is able in some way to *obtain the answers* to the questions proposed. He should be able to give the reason for every step in the process he takes to obtain them, and to do it in a clear and concise manner. It is this which constitutes the value of this branch as a discipline for the mind.

7. Written Arithmetic.—This everybody demands of the teacher; and he is scarcely in danger of being without fair pretensions in this branch. He should, however, know it by its *principles*, rather than by its rules and facts. He should so understand it, that if every arithmetic in the world should be burned, he could still make another, constructing its rules and explaining their principles. He should understand arithmetic so well, that he could teach it thoroughly though all text-books should be excluded from his school-room. This is not demanding too much. Arithmetic is a *certain science*, and used every day of one's life,—the teacher should be an entire master of it.

8. English Grammar.—It is rare that a teacher is found without some pretensions to English grammar; yet it is deplorable to observe how very few have any liberal or philosophical acquaintance with it. In many cases it is little else than a system of barren technicalities. The teacher studies *one* book, and too often takes that as his creed. In no science is it more necessary to be acquainted with several authors. The person who has studied but one text-book on grammar, even if that be the best one extant, is but poorly qualified to teach this branch. There is a philosophy of language which the teacher should carefully study; and if within his power, he should have some acquaintance with the peculiar structure of other languages besides his own. It can hardly be expected that the common teacher should acquire an accurate knowledge of other languages by actually studying them. As a substitute for this, we would recommend that the teacher should very carefully read the little work of Dr. Beard, "Cassell's Lessons in English," also the article "Grammar" in the Edinburgh and other encyclopedias. In this science the mind naturally runs to *bigotry*; and there is no science where the learner is apt to be so *conceited* upon small equirements as in grammar. Let the teacher spare no pains to master this subject.

9. Algebra.—This branch is not yet required to be taught in all our schools; yet the teacher should have a thorough acquaintance with it. Even if he is never called upon to teach it (and it never should be introduced into our common schools till very thorough attainments are more common in the other branches), still it so much improves the mind of the teacher, that he should not be without a knowledge of it. He will teach simple arithmetic much better for knowing algebra. We consider an acquaintance with it indispensable to the thorough teacher, even of the common school.

10. Geometry.—The same may be said of this branch that has been said of algebra. Probably nothing disciplines the mind more effectually than the study of geometry. The teacher should pursue it for this reason. He will teach other things the better for having had this discipline, to say nothing of the advantage which a knowledge of the principles of geometry will give him in understanding and explaining the branches of mathematics.

11. Plane Trigonometry and Surveying.—In many of our schools these branches are required to be taught. They are important branches in themselves, and they also afford good exercise for the mind in their acquisition. The young teacher, especially the male teacher, should make the acquirement.

12. Natural Philosophy.—This branch is not taught in most of our district schools. The teacher, however, should

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understand it better than it is presented in many of the simple text-books on this subject. He should have studied the *philosophy* of its principles, and be fully acquainted with their demonstration. If possible, he should have had an opportunity also of seeing the principles illustrated by experiment. This is a great field; let not the teacher be satisfied with cropping a little of the herbage about its borders.

13. Chemistry.—As a matter of intelligence, the teacher should have acquaintance with this branch. It is comparatively a new science, but it is almost a science of miracles. It is beginning to be taught in our common schools; and that department of it which relates to agriculture is destined to be of vast importance to the agricultural interests of our country. Instead of conjecture, and hazard, and doubt, and experiment, as heretofore, a knowledge of the composition of soils, the food of plants, and the processes of nature in the culture and growth of crops, would elevate agriculture to a conspicuous rank among the exact sciences. The teacher should not be behind the age in this department.

14. Human Physiology.—The teacher should well understand this subject. There is an unpardonable ignorance in the community as to the structure of the human body, and the laws of health, the observance of which is, in general, a condition of longevity, not to say of exemption from disease. By reference to statistics, it has been ascertained that almost a fourth part of all the children that are born die before they are one year old. More than one-third die before they are five years of age; and before the age of eight, more than *one-half* of all that are born return again to the earth! Of those who survive, how many suffer the miseries of lingering disease, almost sighing for death to deliver them from the pangs of life! There is something deplorably wrong in our philosophy of living, else the condition of man would not so commonly appear an exception to the truth that God does all things well. Dr. Woodward, late of the Massachusetts State Lunatic Hospital, says: "From the cradle to the grave, we suffer punishment for the violation of the laws of health and life. I have no doubt that *half* the evils of life, and *half* the deaths that occur among mankind, arise from ignorance of these natural laws; and that a thorough knowledge of them would diminish the sufferings incident to our present state of being in very nearly the same proportion." We know not how an acquaintance with these laws can be in any way so readily extended as through the agency of our teachers of the young. At any rate the teacher himself should understand them, both for his own profit and the means thus afforded him of being directly useful in the discharge of his duties to others. We have already shown that he is responsible to a great extent for the bodily health of his pupils. A thorough knowledge of physiology will enable him to meet this responsibility.

15. Intellectual Philosophy.—This is necessary for the teacher. His business is with the mind. He, of all men, should know something of its laws and its nature. He can know something, indeed, by observation and introspection; but he should also learn by careful study. His own improvement demands it, and his usefulness depends upon it.

16. Moral Philosophy.—A knowledge of this may be insisted on for the same reasons which apply to intellectual philosophy. It is so important that the moral nature of the child be rightly dealt with, that he is a presumptuous man who attempts the work without the most careful attention to this subject.

17. Rhetoric and Logic.—These are of great service to the teacher personally as means of mental discipline and the cultivation of his own taste. Even if he is never to teach them, they will afford him much assistance in other departments of instruction. He certainly should have the advantage of them.

18. Book-keeping.—Every teacher should know something of book-keeping, at least by single entry; and also be conversant with the ordinary forms of business. The profound ignorance on this subject among teachers is truly astonishing. Book-keeping should be a common-school study. But this study, which in practical life comes home to the interest not only of every merchant, but of every farmer, every mechanic, in short every business man, is almost entirely neglected in the schools. Some persons still keep their accounts on bits of paper; others use books, but without any system, order, or intelligibility; and others still mark their scores in chalk or charcoal upon the panel of the cellar-door!

The teacher should qualify himself not only to understand this subject, but to teach it in such a way that it can be easily comprehended by the classes in our common schools.

19. Drawing.—The good teacher should understand the principles of drawing. He should also be able to practise his art. It is of great consequence to him. Without neglect of other things, children can be very profitably taught this art in the common schools. In the absence of apparatus, it is the teacher's only way of addressing the eye of his pupils in illustrating his teaching. Every teacher should take pains not only to draw, but to draw well.

20. Vocal Music.—It is not absolutely essential, though very desirable, to the good teacher, that he should understand music theoretically and practically. Music is becoming an exercise in our best schools; and wherever introduced and judiciously conducted, it has been attended with pleasing results. It promotes good reading and speaking, by disciplining the ear to distinguish sounds; and it also facilitates the cultivation of the finer feelings of our nature. It aids very much in the government of the school, as its exercise gives vent to that restlessness which otherwise would find an *escapement* in boisterous noise and whispering,—and thus it often proves a *safety valve*, through which a love of vociferation and activity may pass off in a more harmless and a more pleasing way. "The schoolmaster that cannot sing," says Martin Luther, "I would not look upon." Perhaps this language is too strong; but it is usually more pleasant to look upon a school where the schoolmaster can sing.

We have thus gone through with a list of studies which, it seems to us, every one who means to be a good teacher, even of a common school, should make himself acquainted with. We would not condemn a teacher who, having other good qualities, and a thorough scholarship as far as he has gone, might lack several of the branches above named. There have been many good teachers without all this attainment; but how much better they might have been with it!

We have made this course of study as limited as we possibly could, taking into view the present condition and wants of our schools. No doubt even more will be demanded in a few years. We would have the present race of teachers so good, that they shall be looked upon by those who succeed them as their "*worthy and efficient predecessors.*"

We ought in this place to add, that the teacher increases his influence, and consequently his usefulness, in proportion as he makes himself conversant with general knowledge. This is too much neglected. The teacher, by the fatigue of his employment and the circumstances of his life, is strongly tempted to content himself with what he already knows, or at best to confine himself to the study of those branches which he is called upon to teach. He should stoutly resist this temptation. He should always have some course of study marked out, which he will systematically pursue. He should, as soon as possible, make himself acquainted generally with the subject of astronomy, the principles of geology, in short, the various branches of natural history. He will find one field after another open before him, and if he will but have the perseverance to press forward, even in the laborious occupation of teaching, he may make himself a well-informed man.

We will venture one other suggestion. We have found it a most profitable thing in the promotion of our own improvement, to take up annually, or oftener, some particular subject to be pursued with reference to writing an extended lecture upon it. This gives point to the course of reading, and keeps the interest fixed. When the thorough investigation has been made, let the lecture be written from memory, embodying all the prominent points, and presenting them in the most striking and systematic manner. It should be done, too, with reference to accuracy and even elegance of style, so that the composition may be yearly improved. In this way certain subjects are for ever *fixed* in the mind. One who carefully reads for a definite object, and afterwards writes the results from memory, never loses his hold upon the facts thus *appropriated.*

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LESSONS IN TRIGONOMETRY.—No. I.

PLANE TRIGONOMETRY

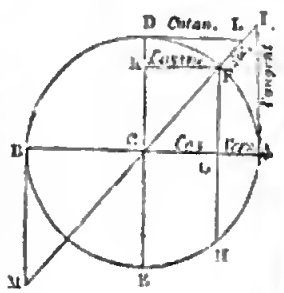
TRIGONOMETRY *is the science which teaches how to determine the several parts of a triangle from having certain parts given.*

Plane Trigonometry treats of plane triangles; Spherical Trigonometry treats of spherical triangles.

The circumference of every circle is supposed to be divided into 360 equal parts, called *degrees;* each degree into 60 *minutes* and each minute into 60 *seconds.* Degrees, minutes, and seconds are designated by the characters °, ′, ″. Thus 23° 14′ 35″ is read 23 degrees, 14 minutes, and 35 seconds.

Since an angle at the centre of a circle is measured by the arc intercepted by its sides, a right angle is measured by 90°, two right angles by 180°, and four right angles are measured by 360°.

The *complement* of an arc is what remains after subtracting the arc from 90°. Thus the arc D F is the complement of A F. The complement of 25° 15′ is 64° 45′.



In general, if we represent any arc by A, its complement is 90° — A. Hence, if an arc is greater than 90°, its complement must be negative. Thus, the complement of 100° 15′ is — 10° 15′. Since the two acute angles of a right-angled triangle are together equal to a right angle, each of them must be the complement of the other.

The *supplement* of an arc is what remains after subtracting the arc from 180°. Thus the arc S D P is the supplement of the arc A P. The suplement of 25° 15′ is 151° 45′.

In general, if we represent an arc by A, its supplement is 180° — A. Hence, if an arc is greater than 180° its supplement must be negative. Thus the supplement of 200° is —20°. Since in every triangle the sum of the three angles is 180°, either angle is the supplement of the sum of the other two.

The sine of an arc is the perpendicular let fall from one extremity of the arc on the radius passing through the other extremity. Thus P O is the sine of the arc A P, or of the angle A C P.

Every sine is half the chord of double the arc. Thus the sine P O is the half of P H, which is the chord of the arc P A H, double of P A. The chord which subtends the sixth part of the circumference, or the chord of 60°, is equal to the radius; hence the sine of 30° is equal to half of the radius.

The *versed sine* of an arc is that part of the diameter intercepted between the sine and the arc. Thus O A is the versed sine of the arc A P.

The tangent of an arc is the line which touches it at one extremity, and is terminated by a line drawn from the centre through the other extremity. Thus A I is the tangent of the arc A P or of the angle A C P.

The secant of an arc is the line drawn from the centre of the circle through one extremity of the arc, and is limited by the tangent drawn through the other extremity.

Thus C I is the secant of the arc A P, or of the angle A C P.

The *cosine* of an arc is the sine of the complement of that arc. Thus the arc D P, being the complement of A P, P E is the sine of the arc D P, or the cosine of the arc A P.

The *cotangent* of an arc is the tangent of the complement of that arc. Thus D L is the tangent of the arc D P, or the cotangent of the arc A P.

The *cosecant* of an arc is the secant of the complement of that arc. Thus C L is the secant of the arc D P, or the cosecant of the arc A P.

In general, if we represent any angle by A,

cos. A = sine (90° — A).
cot. A = tang. (90° — A).
cosec. A = sec. (90° — A).

Since, in a right-angled triangle, either of the acute angles is the complement of the other, the sine, tangent, and secant of one of these angles is the cosine, cotangent, and cosecant of the other.

The sine, tangent, and secant of an arc are equal to the sine, tangent, and secant of its supplement. Thus P O is the sine of the arc A P, or of its supplement, P D P. Also, A I, the tangent of the arc A P, is equal to E M, the tangent of the arc E C P. And C I, the secant of the arc A P, is equal to C M, the secant of the arc B D P.

The versed sine of an acute angle, A C P, is equal to the radius *minus* the cosine C O. The versed sine of an obtuse angle B C P, is equal to radius *plus* the cosine C O, that is, to E O.

The relations of the sine, cosine, etc., to each other, may be derived from the proportions of the sides of similar triangles. Thus the triangles C O P, C A I, C D L, being similar, we have,

1. C O : O P : : C A : A I; that is, cos. A : sin. A : : R : tang. A.

$$\text{Whence tang. A} = \frac{\text{R sin. A}}{\text{cos. A}}$$

2. C O : C P : : C A : C I : that is, cos. A : R : : R : sec. A.

$$\text{Whence sec. A} = \frac{\text{R}^2}{\text{cos. A}}$$

3. O P : C O : : C D . D L; that is, sin. A : cos. A : : R : cot. A.

$$\text{Whence cot. A} = \frac{\text{R cos. A}}{\text{sin. A}}$$

4. O P : C P : : C D : C L; that is, sin. A : R : : R : cosec. A.

$$\text{Whence cosec. A} = \frac{\text{R}^2}{\text{sin. A}}$$

5. A I : A C : : C D : D L; that is, tang. A : R : : R : cot. A.

$$\text{Whence tang. A} = \frac{\text{R}^2}{\text{cot. A}}$$

Also in the right-angled triangle C O P, we find $\text{CO}^2 + \text{OP}^2 = \text{CP}^2$; that is, $\text{sin.}^2 \text{A} + \text{cos.}^2 \text{A} = \text{R}^2$; or,

The square of the sine of an arc, together with the square of its cosine, is equal to the square of the radius.

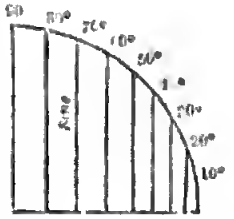
$$\text{Hence sin. A} = \pm \sqrt{\text{R}^2 - \text{cos.}^2 \text{A}}.$$

$$\text{And cos. A} = \pm \sqrt{\text{R}^2 - \text{sin.}^2 \text{A}}.$$

A table of *natural sines, tangents,* etc., is a table giving the lengths of those lines for different angles in a circle whose radius is unity.

Thus, if we describe a circle with a radius of one inch, and divide the circumference into equal parts of ten degrees, we shall find

the sine of	10°	equals	0·174	inch;
" "	20°	"	0·342	"
" "	30°	"	0·500	"
" "	40°	"	0·643	"
" "	50°	"	0·766	"
" "	60°	"	0·866	"
" "	70°	"	0·940	"
" "	80°	"	0·985	"
" "	90°	"	1·000	"



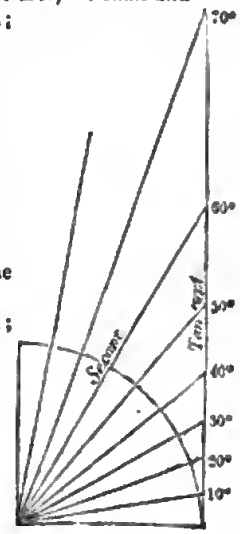
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If we draw the tangents of the same arcs, we shall find

the tangent of	10°	equals	0·176	inch;
" "	20°	"	0·364	"
" "	30°	"	0·577	"
" "	40°	"	0·839	"
" "	45°	"	1·000	"
" "	50°	"	1·122	"
" "	60°	"	1·732	"
" "	70°	"	2·747	"
" "	80°	"	5·671	"
" "	90°	"	infinite.	

Also, if we draw the secants of the same arcs, we shall find that

the secant of	10°	equals	1·015	inch;
" "	20°	"	1·064	"
" "	30°	"	1·155	"
" "	40°	"	1·305	"
" "	50°	"	1·556	"
" "	60°	"	2·000	"
" "	70°	"	2·924	"
" "	80°	"	5·759	"
" "	90°	"	infinite.	

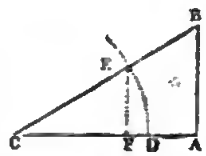


SOLUTIONS OF RIGHT-ANGLED TRIANGLES.

THEOREM I. *In any right-angled triangle, radius is to the hypothenuse as the sine of either acute angle is to the opposite side, or the cosine of either acute angle to the adjacent side.*

Let the triangle CAB be right-angled at A, then will

R : CB : : sin. C : BA : : cos. B : CA.



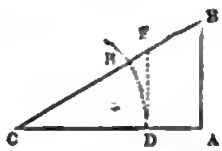
From the point C as a centre, with a radius equal to the radius of the tables, describe the arc DE, and on AC let fall the perpendicular EF. Then EF will be the sine, and CF the cosine of the angle C. Because the triangles CAB, CFE are similar, we have,

CE : CB : : EF : BA,
or R : CB : : sin. C : BA
Also, CB : CB : : CF : CA,
or R : CB : : cos. C : CA.

THEOREM II. *In any right-angled triangle, radius is to either side as the tangent of the adjacent acute angle is to the opposite side, or the secant of the same angle to the hypothenuse.*

Let the triangle CAB be right-angled at A, then will

R : CA : : tang. C : AB : : sec. C : CB.



From the point C as a centre, with a radius equal to the radius of the tables, describe the arc DE, and from the point D draw DF perpendicular to CA. Then DF will be the tangent, and CF the secant of the angle C. Because the triangles CAB, CDF are similar, we have,

CD : CA : : DF : AB,
or R : CA : : tang. C : AB
Also, CD : CA : : CF : CB,
or R : CA : : sec. C : CB.

In every plane triangle there are *six* parts; three sides and three angles. Of these, any three being given, provided one of them is a side, the others may be determined. In a right-angled triangle, one of the six parts, viz. the right angle, is always given; and if one of the acute angles is given, the other is, of course, known. Hence the number of parts to be considered in a right-angled triangle is reduced to *four*, any two of which being given, the others may be found.

We may, therefore, have four cases, according as there are given,

1. The hypothenuse and the angles;
2. The hypothennse and a leg;
3. One leg and the angles;
4. The two legs.

All of these cases may be solved by the two preceding theorems.

CASE I. *Given the hypothenuse and the angles, to find the base and perpendicular.*

This case is solved by Theorem I.

Radius : hypothenuse : : sine of the angle at the base : perpendicular;
: : cosine of the angle at the base : base.

EX. 1. Given the hypothenuse 275, and the angle at the base 57° 23', to find the base and perpendicular.



The natural sine of 57° 23' is ·842296;
" cosine " ·539016.
Hence 1 : 275 : : ·842296 : 231·631 = AB.
1 : 275 : : ·539016 : 148·229 = AC.

The computation is here made by natural numbers. If we work the proportion by logarithms, we shall have,

Radius	10·000000
Is to the hypothenuse 275	2·439333
So is the sine of C 57° 23'	9·925465
To the perpendicular 231·03	2·364798.
Also, Radius	10·000000
Is to the hypothenuse 275	2·439333
So is the cosine of C 57° 23'	9·731602
To the base 148·23	2·170035.

EX. 2. Given the hypothenuse 67·43, and the angle at the perpendicular 38° 43', to find the base and perpendicular.
Ans. The base is 42·175, and perpendicular 52·612.

CASE II. *Given the hypothenuse and one leg, to find the angles and the other leg.*
This case is solved by Theorem I.

Hypothenuse : radius : : base : cosine of the angle at the base.
Radius : hypothenuse : : sine of the angle at the base : perpendicular.

EX. 1. Given the hypothenuse 54·32, and the base 32·11, to find the angles and the perpendicular.
By natural numbers, we have,

54·32 : 1 : : 32·11 : ·591127, which is the cosine of 53° 45' 47".
Also, 1 : 54·32 : : ·806580 : 43·813 = the perpendicular.

The computation may be performed more expeditiously by logarithms, as in the former case.

EX. 2. Given the hypothenuse 332·49, and the perpendicular 98·399, to find the angles and the base.
Ans. The angles are 17° 12' 51" and 72° 47' 9"; the base, 317·6.

CASE III. *Given one leg and the angles, to find the other leg and hypothenuse.*

This case is solved by Theorem II.

Radius : base : : tangent of the angle at the base : perpendicular.
: : secant of the angle at the base : hypothenuse.

EX. 1. Given the base 222, and the angle at the base 25° 15', to find the perpendicular and hypothenuse.
By natural numbers, we have,

1 : 222 : : ·471631 : 104·70, perpendicular;
: : 1·105639 : 246·45, hypothenuse.

The computation is, perhaps, more expeditiously performed by logarithms as in Case I.

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Ex. 2. Given the base 125, and the angle at the base 51° 19', to find the hypothenuse and perpendicular.

Ans. Hypothenuse, 199·99; perpendicular, 156·12.

CASE IV. *Given the two legs, to find the angles and hypothenuse.*

This case is solved by Theorem II.

Base : radius : : perpendicular : tangent of the angle at the base.
Radius : base : : secant of the angle at the base : hypothenuse.

Ex. 1. Given the base 123, and perpendicular 765, to find the angles and hypothenuse.

By natural numbers, we have,

123 : 1 : : 765 : 6 219512, tangent of 80° 51' 57".
1 : 123 : : 6 299338 : 774·82, hypothenuse.

The computation may also be made by logarithms, as in Case I.

Ex. 2. Given the base 53, and perpendicular 67, to find the angles and hypothenuse.

Ans. The angles are 51° 39' 16" and 38° 20' 44"; hypothenuse, 85·428.

Examples for Practice.

1. Given the base 777, and perpendicular 345, to find the hypothenuse and angles.
2. Given the hypothenuse 324, and the angle at the base 48° 17', to find the base and perpendicular.
3. Given the perpendicular 543, and the angle at the base 72° 45', to find the hypothenuse and base.
4. Given the hypothenuse 666, and base 432, to find the angles and perpendicular.
5. Given the base 634, and the angle at the base 53° 27', to find the hypothenuse and perpendicular.
6. Given the hypothenuse 1234, and perpendicular 555, to find the base and angles.

When two sides of a right-angled triangle are given, the third may be found by means of the property that the square of the hypothenuse is equal to the sum of the squares of the other two sides.

Hence $h = \sqrt{b^2 + p^2}$; $b = \sqrt{h^2 - p^2}$; $p = \sqrt{h^2 - b^2}$.

Ex. 1. If the base is 2720, and the perpendicular 3104, what is the hypothenuse?

Ans. 4127.

Ex. 2. If the hypothenuse is 514, and the perpendicular 432, what is the base?

LESSONS IN GREEK.—No. LX

By JOHN R. BEARD, D.D.

IMPORT AND USE OF THE GENITIVE.

THE genitive is the case of the determinative attribute expressed by a substantive. The genitive, consequently, serves for the expression of an object which is so blended with another as to individualise that other.

The numerous applications of the genitive may be ranged under three principal heads:—1. The genitive denotes an object to which another belongs as a part or member; this is called the *genitivus partitivus*, the partitive genitive. 2. The genitive denotes an object to which another belongs as a possession or property; this is called the *genitivus possessivus* (hence the English term for the genitive, namely, the "possessiva case"), the genitive of possession. 3. The genitive denotes an object from which another proceeds, by which another is produced (hence the name genitive, from *gigno*, I beget) or occasioned; this is called the *genitivus auctoris*, or the *genitivus materiæ*, or again, the *genitivus causalis*, the causal or originating genitive.

Taking up these three heads in succession, we have

1. *The Partitive Genitive.*

With nouns denoting a part or number of a whole, the whole is put in the genitive case. So are collective nouns put in the genitive, being governed by the word that signifies a part, a portion, or an individual involved in their collective signification: *e.g.*

τα του σωματος μερη και μελη
the parts and members of the body.

ανηρ του δημου
a man of the people.

Adjectives in the superlative degree govern a genitive of the class: *e.g.*

μεγιστον εστι των αγαθων αρετη
virtue is the greatest of good things.

When, however, the superlative signifying a very high degree of the quality does not involve a comparison, it stands in the same case as the noun which it qualifies: *e.g.*

Κυρος ενδοκιμωτατος βασιλευς γεγενηται
Cyrus was a very illustrious king.

Verbs which are derived from a superlative, or express a superlative idea, require their object in the genitive. Such verbs are those which denote to govern, to rule, to be superior, as αρχειν, to rule; πρωτευειν, to be first; κρατιστευειν, to master; αριστευειν, to be the best; τυραννεῖν, to govern as a usurper; βασιλευειν, to reign, to reign over; ἡγεμονευειν, to be in command as a general; ἡγεισθαι, to rule; επιστατεῖν, to sway; προσταττεῖν, to enjoin, direct; στρατηγειν, to command an army, to be a general; ναυαρχεῖν, to command a fleet, to be an admiral.

The verb αιτασειν may take either a genitive or a dative. When ἡγεῖσθαι signifies to lead, to act as a leader, it governs a dative.

Verbs which denote an action that affects the object only in part, put that object in the genitive. Such verbs are, μετεχειν, to share; κοινωνειν, to have in common; μεταλαμβανειν, to partake of; μεταδιδοναι, to give another a portion of; τυγχανειν, to fall upon, to obtain; αντιᾶν, to light on, to meet with; κληρονομεῖν, to acquire by inheritance; αντιποιεῖσθαι, μετιποιεῖσθαι, to claim. Such verbs, also, are those which signify to touch (ἅπτεσθαι, ψαυειν, θιγγανειν); to be near, to border on, to approach (ἐγγιζειν, πλησιαζειν); to hold to any thing (ἐχεσθαι, αντεχεσθαι, αντιλαμβανεσθαι); to strike, to hit, to reach (τυγχανειν, ἐξικνεῖσθαι, ἐφικνεῖσθαι); to aim at (στοχαζεσθαι); to tread on (ἐπιβαινειν). In the same category may be placed verbs which mean to begin (ἀρχειν, ἀρχεσθαι); to attempt, to endeavour (πειρᾶσθαι); to taste (γευεσθαι); to cause another to taste (γευειν). Instances are given in the exercise. In addition, take this one from Menander:

νομων εχεσθαι παντα δει τον εωφρονα
the wise man ought to cleave to the laws.

The construction of these verbs is followed by a number of adjectives which involve the idea of participation, or the idea of proximity and touching. Such adjectives are, μετοχος, sharing; ἀμοιρος, having no share in; μεσος, in the middle; ἐναντιος, opposite. So, also, adverbs of similar import govern the genitive, as ἐγγυς, near; οπισθεν, behind; περαν, on the other side.

According to the analogy of verbs meaning to touch, the poets construe verbs which signify to entreat, as it was customary in supplication to touch the person to whom the prayer was addressed; the part touched was put in the genitive: *e.g.*

ἱκετευω σε τωνδε γενυατων και ευ γενειου
I implore thee by these knees and by thy beard.

So, also, may the person entreated be put in the genitive: *e.g.*

λισσομαι Ζηνος Ολυμπιου
I entreat Olympian Jupiter.

So, when with verbs which governs an accusative a part only of the object spoken of is intended, the partitive genitive is used: *e.g.*

Ἐδωκα σοι των χρηματων
He gave *thee* some money.

Thus the Greeks said, πινειν οινον, and πινειν οινου.

2. *The Genitive of Possession*

is generally used when it is intended to intimate that an object in some sense belongs to a person. This is the strictly proper

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use of the possessive genitive. By analogy, the use is extended to animals, and even things without life.

ἡ Περικλέους οἰκία	οἱ τῆς πόλεως νόμοι
Pericles's house.	the *city's* laws.

The use of this genitive in Greek is more extended than it is in English. When we say "the love of a person," we may mean love as coming from a person, or love as directed towards a person. In general, however, the latter is expressed by means of the preposition τπ or toward; as, "my love to you is very great." Here, *you* is the object after the preposition to. In Greek the genitive would be employed, as εὐνοια σου, goodwill to thee; this, then, may be called the objective or passive genitive. This genitive in Greek sometimes requires to be represented in English by other prepositions: *e.g.*

μῖσος τινος,	hatred *against* a person.
πόθος τινος,	desire *for* a person.
θάρρος τινος,	courage *in* regard to a person.
φόβος τινος,	fear *of* a person.
ἔλεος τινος,	pity *for* a person.
δουλεία τινος,	servitude *to* a person.
πόλεμος τινος,	war *against* a person.
ἐπιχειρήσεις τινος,	attempt *on* a person.
βία τινος,	violence *to* a person.

A twofold meaning is often involved in the genitive; whence arises an ambiguity which you must look to the context and import of the passage to solve: *e.g.*

θεῶν ὅρκοι, either oaths of the gods, *or* oaths by the gods.
σπονδαὶ τινος, either a truce you have made, or a truce made by another.
ἐπιτείχισμα τινος, either your fortification, or a fortification against another.
λύτρα τινος, a ransom by or for you.
τροπαῖα τῶν Λακεδαιμονίων, the trophies gained or lost by the Spartans.
νόμος τινος, a law passed by you or passed for another.

The genitive is used of places when, in English, we should employ the preposition in: *e.g.*

τῆς Ἀττικῆς ἐν Ἐλευσῖνι
at Eleusis *in* Attica.

The adjectives ἴδιος and οἰκεῖος, one's own, take the person to whom the possession is ascribed, in either the genitive or the dative; but the adjective ἱερός, sacred to, always requires the genitive.

Verbs which denote to be of, to spring from, such as εἶναι, γίγνεσθαι, etc., take a genitive of the object whence a person or thing is said to arise: *e.g.*

ἀγαθῶν ἐστι πρόγονοι
you are of a good family.

According to this analogy we have certain phrases, as ἑαυτοῦ εἶναι, to be of himself, that is, to be his own master; τοῦ λέγοντος εἶναι, to be in the power of the speaker; τοῦ ἄρχοντος ἐστι, it is a ruler's duty or function, σωφρονος ἀνδρὸς ἐστι, it is the part or the mark of a wise man.

With adverbs of place and time, the indications of place and time are put in the genitive: *e.g.*

πανταχοῦ τῆς γῆς ἔστιν ἀγαθοὺς τε καὶ πονηροὺς
everywhere in the world you will find both good men and bad.

After a similar manner is the genitive employed after demonstrative pronouns and adjectives in the neuter gender, to signify the extent or degree of a quality: *e.g.*

εἰς τοῦτ' ἦλθεν ὕβρεως
he went to such a pitch of insult.

Determinations of time may be put in the genitive. Properly, such determinations are those which indicate a continuance; in which cases the genitive may have arisen by the omission of the preposition διά; as νυκτός (that is, διὰ νυκτός), by night. But an object which extends may be regarded as simply a point, as in our phrase "by night," that is, through the night, all night long. Accordingly the genitive may be used to denote a point of time. When length of time and continuance are specially indicated, a preposition should be employed, as in English, "during winter," "throughout the day." Observe the following idioms: τοῦ μηνός, monthly; τοῦ ἐνιαυτοῦ, yearly; τοῦ λοιποῦ, for the future.

Here belongs what is called the genitive absolute: *e.g.*

ἐκείνου εἰπόντος, πάντες ἐσιγων
he speaking, all were silent.

The genitive (in Latin, the ablative) absolute, or the genitive which *in construction* (not sense) is independent of other words, is in reality an abridged or elliptical sentence, which indicates the circumstances under which the ensuing statement is made or becomes true. Being a sentence in itself, its noun cannot form the subject of the connected preposition, which, consequently, must have a subject of its own.

3. *The Causal Genitive.*

The genitive considered as denoting that whence any thing comes, may refer to place. Accordingly the genitive is used with verbs which signify to remove from, to separate, as χωρίζειν, διορίζειν, ὁποκρίνειν, εἴργειν, ἀποκλείειν, ἐκβάλλειν, ἀφίστασθαι, and the like; also to remove one's self, to be removed, to be at a distance, as ἀπέχειν, ὀπίσω, ἀφίστασθαι, ἀποστατεῖν, μεθίστασθαι; again, verbs which mean to yield, to give way before, as εἴκειν, ὑπείκειν, παραχωρεῖν, with the adverbs πόρρω, ἐκάς, and πλήν. Moreover, verbs which signify to free, loosen, emancipate, deliver, as ἀπαλλάττειν, λύειν, ἀπολύειν, ἐλευθεροῦν, σώζειν; to get off (ἀπαλλάττεσθαι); to fail (ἁμαρτάνειν, ἀφαμαρτάνειν), with the adjective ἐλεύθερος. Once more; the genitive is used with verbs which mean to abstain, to turn from (ἔχειν, ὀφίστασθαι, ἀποτρέπειν, παύειν, καταλύειν); to hinder (κωλύειν, εἴργειν, ἐμποδὼν εἶναι); to cease, stop, discontinue (παύεσθαι, ἀφίεσθαι, λήγειν, λωφᾶν, ἐπέχειν); to abstain (ὀπέχεσθαι, and consequently φείδεσθαι, to spare, and ἀφείδειν, not to spare); to rob, deprive of (στερίσκειν, ἀποστερεῖν, ὀφορεῖν, περιαιρεῖν); to deceive, to mislead (σφάλλειν); to be misled, to fail (σφάλλεσθαι, ψεύδεσθαι, ἀποτυγχάνειν).

Difference of quality bears a resemblance to distance in space. Accordingly verbs which signify to differ, to be different (διαφέρειν, διαπῆναι, ἀλλόττειν), take a genitive; also the adjectives and adverbs which indicate diversity, as διαφορος, διαφερόντως, ἄλλος, ἀλλοῖος, ἕτερος: *e.g.*

οἱ πλούσιοι μεγα διαφέρουσι των πτωχων
the rich greatly differ from the poor.

With the verbs to lay hold of, seize, hold (λαμβάνειν, αἴρειν, ἔχειν, ἄγειν), the part touched, as being that with which the seizure begins, is put in the genitive; as

τῆς χειρος τον παῖδα ἄγειν
to lead the boy by the hand.

The genitive of origin, or the genitive properly so called, denotes not only the author or source and the material of which a thing consists, but in a restricted manner the object also from the consideration of which our opinion or judgment is given. This use, then, may be divided into the proper and the improper.

The proper use of the genitive of origin is found in the assigning of the author or originator (in Latin, *genitivus auctoris*) both with substantives and with the verbs εἶναι and φῦναι. The proper use of this genitive is seen also when it gives the substance or material (*genitivus materiæ*) of which a thing is made, partly in using substantives and partly in using εἶναι, ὑπάρχειν, γίγνεσθαι; also ποιεῖν, ἐργάζεσθαι, κατασκευάζειν, etc. Thus we find οἰκημα ξύλων, a house of wood, that is, a wooden house:

λίθου στρωμενη ἐστιν ἡ ὁδος
the road is paved with stone.

By an easy transition, the genitive of the material passes into the genitive of fulness, or the genitive required after verbs and adjectives which denote abundance or want; such as πιμπλάναι, πληροῦν, γεμεῖν, πλουτεῖν, εὐπορεῖν, μεστος, πλεως, πλήρης, πλούσιος, εὔπορος; κενοῦν, ἐρημοῦν, σπανίζειν, ἀπορεῖν, ἐλλείπειν, δεῖσθαι, δεῖν, κενος, ἔρημος, ἄπορος, ὀρφανος, etc.

Hence the price, or equivalent of a thing, is put in the genitive (*genitivus pretii*): *e.g.*

Νικίας λέγεται δοῦλον πρίασθαι ταλάντου
Nicias is said to have bought a slave for a talent.

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The moral worth of an object is also put in the genitive:

το ακουσιον αμαρτημα συγγνωμης αξιον
an unintentional fault is worthy of pardon.

The force of the genitive is augmented by means of *περι*, with adjectives of comparative value. Thus the Greeks said,

περι πολλου ποιεῖσθαι
to value very highly.

And after the same manner they employed these phrases: *περι πλειστου ποιεῖσθαι*, to value very highly; also, *περι πλειονος, περι παντος, περι σμικρου* (to value little), *περι ελαττονος, περι ελαχιστου*, with the verbs *ποιεῖσθαι, ἡγεῖσθαι, νομιζειν*, etc.

The improper use of the genetic genitive, or genitive of origin, is found in connexion with the comparative, for the compared object is regarded as the point from the consideration of which arises an attribute or predicate which appears in the comparative degree; the compared object, in consequence, is put in the genitive case. This use of the genitive has already been illustrated and exemplified.

Occasionally a preposition is prefixed to the compared object, such as *αντι* or *προ*: *e.g.*

αἱρετωτερος εστιν ὁ καλος θανατος αντι του αισχρου βιου
an honourable death is preferable to a base life.

As with the comparative, so with words which imply comparison a genitive is used. Such words are those which contain a comparative word in their composition: *e.g. ὑστεριζειν* (*ὑστερος*), *πλεονεκτεῖν, μειονεκτεῖν, μισεῖσθαι, ελαττοῦσθαι*. Such words are also those in the meaning of which a comparison is involved; as *διαφερειν, ὑποφερειν, προφερειν, περιειναι, προεχειν, ὑπερεχειν, ὑπερβαλλειν*, to excel, to surpass; *λειπεσθαι, απολειπεσθαι, ελαττοῦσθαι, ἡττᾶσθαι, νικᾶσθαι*, to be surpassed, to be inferior to; again, *περιγιγνεσθαι, κρατεῖν, επικρατεῖν*, to overcome; also, *προαιρεῖσθαι, αἱρεῖσθαι, προτιμᾶν, προκρινειν*, to prefer; once more, *εγκρατης* (*ακρατης*), *κυριος εἰναι*, to be master of; and the like.

The causal genitive, strictly so regarded, denotes the object which is set forth as the occasion of a condition or result.

The occasion may be an object of sense, as with *ασφραινεσθαι*, to smell; so with *οζειν, πνεῖν*, and *προσβαλλειν*, which last word means to throw (that is, your desire) towards, to reach after; also with verbs of hearing, as *ακουειν, ακροᾶσθαι*, the person is constantly in the genitive.

The verb *ὑπακουειν*, to listen to, that is, to obey, and the adjective of the same formation, namely, *ὑπηκοος*, obedient, take indifferently either the genitive or the dative; whilst with *ανηκουστεῖν*, to be disobedient, the genitive is the more common.

The causal genitive appears further in cases were the occasion of mental or moral influence is expressed; as with *μνημονευειν, μεμνῆσθαι*, to call to mind, to remember; *αναμιμνησκειν, ὑπομιμνησκειν*, to remind, to put in mind; *επιλανθανεσθαι, αμνημονεῖν*, to forget, which, however, have the thing in the accusative; also, verbs expressive of care, desire, endeavour, disregard, etc., as *φροντιζειν*, to care for; *μελει μοι*, I am concerned for; *επιμελεῖσθαι*, to attend to; *ἐντρεπεσθαι*, to turn toward, to strive for; *επιθυμεῖν, ἐφιεσθαι, ορεγεσθαι*, to desire; *ἐρᾶν*, to love, that is, to be desirous of; *πεινῆν*, to hunger after; *διψῆν*, to thirst for; *αμελειν*, to neglect; *ολιγωρειν*, to think little of; *καταφρονειν*, to look down on, to despise; *καταγελᾶν*, to laugh at; together with the corresponding adjectives, *επιμελης, αμελης, ολιγωρος*, etc.: *e.g.*

ἑαυτοῦ κηδεται ὁ προνοῶν ἀδελφοῦ
he who cares for his brother cares for himself.

The causal genitive, moreover, is found with verbs which denote an excitement or passion of the mind, as *ζηλοῦν*, to be envious of; *ευδαιμονιζειν*, to congratulate; *φθονεῖν*, to envy; *ελεεῖν*, to pity; *μνησικακεῖν*, to be revengeful; *μεταμελεισθαι* (*μεταμελει μοι*), to repent; which, with a dative of the person, take a genitive of the thing; the latter you may more easily construe with the aid of a preposition or a prepositional phrase, such as, on account of.

To the same class may be referred *θαυμαζειν* and *ἀγᾶσθαι*, to admire, wonder at; as *θαυμαζειν τινα τινος*, to admire a person for some quality; also

αγαμαι σην την προθυμιαν
I admire thy ardour.

As with verbs of wondering, so with exclamations is the genitive found: *e.g.*

οιμοι των εμων κακων!
alas! my misfortunes.

With verbs signifying to accuse, *αιτιᾶσθαι*; to sue at law-*εἰσαγειν, διωκειν, γραφεσθαι*; to be sued or put on trial, *φευγειν*! to condemn, *δικαζειν, κρινειν*; to convict, *ἑλεῖν*; to be convicted, *ἁλῶναι, ὀφλεῖν*; to acquit, *αφιεναι, απολυειν*; to punish, *τιμωρεῖσθαι*, the charge is in the genitive; so with the adjectives *αιτιος, ὑπαιτιος, ενοχος*, to be liable to the charge, to be under the imputation, to be accused of, the genitive of the alleged crime is employed: *e.g.*

Μιλητος Σωκρατη ασεβειας εγραψατο
Miletus accused Socrates of impiety.

Also the punishment is put in the genitive: *e.g.*

ἁ μεν θανατου εκριθη, ὁ δε αφεθη των εγκληματων
the one was condemned to death, the other was acquitted of the charges.

The causal genitive is used also with adjectives and adverbs which assign the general condition of the subject in virtue of which the subject and the predicate are united. Such a genitive is found with the adjectives *ευδαιμων, ὀλβιος, μακαριος*, happy; *ανολβιος, αχετλιος, τλημων*, unhappy; and with the adverbs *εὐ, κακῶς, καλῶς, μετριως, ἀντως, ὡς, πῶς*, etc., *e.g.*

ευδαιμων μοι ανηρ εφαινετο και του τροπου και των λογων
the man appears to me happy in both disposition and words.

This genitive is, moreover, found with adjectives signifying experienced, inexperienced, aware of, ignorant of, skilled or unskilled in; as *εμπειρος, απειρος; ἰδιωτης; γνωμων; επιστημων, ανεπιστημων; ἀνμαθης, ἀμαθης; φιλομαθης*, fond of learning; *ὀψιμαθης*, learning late (in life), etc.: *e.g.*

ὁ γραμματων απειρος ον βλεπει βλεπων
he who is ignorant of learning, seeing sees not.

The genitive is also employed to denote the object after verbs compounded with prepositions which govern the genitive; such as *κατα*, as *καταγιγνωσκειν, καταδικαζειν, κατακρινειν*, to condemn, to cast in a law-suit, to find guilty; also when the compound expresses a disadvantageous opinion or judgment, as *καταψηφιζεσθαι*, to vote against; *κατηγορεῖν*, to charge with, the person is put in the genitive, the thing in the accusative: *e.g.*

πολλῃ ὑμῶν κατιγνωκασιν ανανδριαν
they have condemned us of great cowardice.

The verbs which are compounded of *απο* and *ἐξ*, and which denote separation and distance; also those which are compounded of *ὑπερ* and *προ*, and which signify superiority, require the genitive of the object from which the separation, etc., takes place: *e.g.*

πολλους ἡ γλῶττα προτρεχει τῆς διανοιας
with many the tongue outruns the judgment.

Exercises.—Greek-English.

Πληθος στρατιωτων παρην. Σοι εστι πολυς αριθμος λιθων. Σταγονες ὑδατος κοιλαινουσι πετρας. Αφικνοῦνται νικησκοι τῶν ἱππεων. Αρχιας των Ἡρακλειδων παριστιν. Σωκρατης ην των αμφι Μιλητον στρατευομενων. Οι αν εν τοις ανδρασι διαγενωνται ανεπιλητοι, οὑτοι των γεραιτερων γιγνονται. Σολων τῶν ἑπτα σοφιστῶν εκληθη. Θνητων μεν ουδεις εστιν ευδαιμων ανηρ. Των εχθρῶν πολλοι μεν ὑπλων εστερηνται, πολλοι δε ἱππων. Των πολεμιων οἱ μεν απωλοντο, οἱ δε διεφυγον. Ανεθανον εν τῃ μαχῃ τῶν μεν ὁπλιτων διακοσιοι, τῶν δε ἱππιων πεντηκοντα. Ολιγοι των ανθρωπων φρονοῦσι. Ολιγοι ανθρωποι φρονοῦσι. Τις ανδρων ην ὁ τολμησας ταδε; Τῶν αγαθῶν, ἁ μυρια ην μοι, περιεστιν ουδεν. Των ανδρων τοις καλοις καγαθοις αἰσχιστερον εστι θανειν η δουλευειν. Αισχρον

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τους μεν γραφις απεικαζειν τα καλα των ζωων, τους δε παιδας μη μιμεῖσθαι τους σπουδαιους των γονεων. Κτηματων παντων τιμιωτατον εστιν ανηρ φιλος ουνεκος τε και ευνους. Ἡ φιλια μεγιστον αγαθον και ἡδιστον ανθρωποις εστιν. Οἱ Ἀθηναῖοι δε ναμιν εἰχον μεγιστην των Ἑλληνων. Παντως των δεινων ὁ φοβος μαλιστα καταπληττει τας ψυχας. Λακεδαιμων επι πολυν χρονον επηρτευσε τῆς Ἑλλαδος. Ἀλκιβιαδης των ἡλικιωτῶν εκρατιστευσεν. Πολυκρατης Σαμον ευρασεν. Παντων δεσποζειν αξιοῖ ὁ τυραννος. Ἀαχης ὁπλιτῶν και ἱππιων εστρατηγει. Λακεδαιμονιοι Πελοποννησον τῆς ξυμπασης ἡγεῦνται και τῶν ἐξω ξυμμαχων πολλῶν. Ὁ ανθρωπος μετεχει της θειας φυσεως. Επειδη θνητου ωματος ευτυχις, αθανατου δε ψυχης πειρῶ της ψυχῆς αθανατον μνημην καταλιπεῖν. Συν τοις θειοις αρχεσθαι χρη παντος εργου. Ἡ εν Μαραθῶνι γενομενη μαχη της σωτηριας ἠρξε τοῖς Ἑλλησιν. Παντος μαθηματος γεγεσθαι χρη. Οἱ πολεμιοι ετεραν τῆς γης. Μετριως απολαυει των ἡδεων. Οἱ κινδυνοι των ἐφεστηκοτων ἐλαττους. Ἱερος εστιν ὁ χῶρος τῆς Ἀρτεμιδος. Τα των φιλων εμαυτοῦ εἰναι νομιζω. Ἀλκιβιαδου εστιν ἡ κυων. Οἱ Περσαι την Ἀσιαν ἑαυτων ποιουνται. Τῆς αυτῆς γνωμης ειμι. Ου των αυτων ουτε λογων ουτε ἐργων εστιν ἡ νεοττις τῳ γηρᾳ. Πατρος μεν ἐη λεγεται ὁ Κυρος γενεσθαι Καμβυσον, μητρος δε ὁμολογεῖται Μανδανης γενεσθαι. Θουκυδιδης οικιας μεγαλης ην. Κακουργον μεν εστι κριθηναι· αποθανειν, στρατηγοῦ δε μαχομενον τοις πολεμιοις. Οἱ Ἀθηναῖοι επι μεγα ἐχωρησαν δυναμεως. Οἱ πολεμιοι απεχωρησαν της νυκτος. Ἡ οικια χειμῶνος μεν ευηλιος εστω, του δε θερους ευσκιος. Ουδεις με ἠρωτηκε καινον ουδεν πολλῶν ετῶν. Ἡμερας γεγενημενης, προσῆλθον οἱ πολεμιοι. Κυρου βασιλευοντος, πολλα τε και καλα ἐργα ὑπο των Περσῶν επραχθη. Ἀντεχει ἡ Πυλος τῆς Σπαρτης σταδιους τετρακοσιους. Τυραννων ηλευθερωθησαν οἱ Ἀθηναῖοι. Λῦσον με δεσμῶν. Πολυ μειζον με αγαθον εργασει αμαθιας παυσας την ψυχην η νοσου το σῶμα. Λυησιλαος μεθης αποσχεσθαι φετο χρῆναι. Παντων των αγαθων εστερημεθα. Οἱ Γερμανοι μικρον ἐξαλλαττουσι του Κελτικου φυλου. Ἑτερον το ἠδυ τοῦ αγαθου. Τα αγαλματα η χαλκου πεποιηται η λιθου η χρυσοῦ. Ἡ κρηπις λιθων εστι μεγαλων. Ὁ Μαρσυας ποταμος το εὖρος εικοσι και πεντε εστι ποδων. Ὁ πατς δικα εστιν ετῶν. Δακρυων εμπιπλανται μου οἱ ὀφθαλμοι. Ὁ μηδεν αδικῶν ουδενος δεῖται νομου. Πολλης ευλαβειας δεῖ. Ειρηνης και ευφροσυνης παντα πλεα ην. Χρηματων μεν εμπορευομεν, λογων δε απορεῦμεν. Οἱ Θρᾷκες ωνοῦνται τας γυναῖκας παρα των γονεων χρηματων πολλων. Των πονων πωλοῦσιν ἡμῖν παντα ταγαθ' οἱ Θεοι. Μισθου ἐργαζονται οἱ δημιουργοι. Οἱ αριστευσαντες τιμῶν αξιοῦνται και δωρων. Επιδεικνυτω τις τοις αρχομενοις ἑαυτον αξιον αρχης. Μητε παιδας περι πλειονος ποιου, μητε τα ζῆν μητε αλλο μηδεν προ τοῦ δικαιου. Σωκρατης παντων ανθρωπων ευηνεγκε σοφια. Οἱ Ἑλληνες εκρατησαν των βαρβαρων. Και θεους ακουω ἐρωτος ἡττασθαι. Οἱ τυραννοι τῃ ευφροσυνῃ μειονεκτοῦσι των ἰδιωτῶν. Σωφρονος εστιν εγκρατῆ εἰναι επιθυμιῶν πασων. Ουτε αυτος τοῦτο πωποτε Σωκρατους ηκουσα, ουτε αλλον φαντος ακηκοεναι βουλομην. Των απορρητων φιλων μεμνησο. Των νουθετικῶν λογων ῥαδιως επιλανθανονται οἱ νεοι. Ἡ τοῦ Θεοῦ φρονησις ἀμα παντων επιμελεῖται. Ου μεγαλων δεῖ επιθυμεῖν παρα το δικαιον. Επιμελεις εμικρῶν εισιν οἱ θεοι ουχ ἡττον η των μεγεθει διαφεροντων. Ζηλω σε τοῦ πλουτου. Της αρχῆς ου φθονουσι τοῖς Βασιλεῦσιν. Τοις Δισβιοις μνησικακοῦμεν τῆς αποστασεως. Φεῦ του ανδρος! Ὦ Ζεῦ βασιλεῦ, της λιπαροτητος των φρενων! Αναξαγορας ασεβειας εκριθη. Μηδεις δειλιας εστω ενοχος. Μετριως εχουσιν χρηματων. Οὑτως ἐχω τροπων. Ὡς ταχους ἐχει εκαστος. Ὦ σχετλια συ των αμετρητων πονων. Δει φιλομαθη σε ἁπαντων εἰναι. Ουδενος πωνου ἀριστασαι.

ENGLISH-GREEK.

The son remembers the father's benefits. The girl forgets her mother's love. They envy you your happiness. The good are concerned for virtue. He repents of his folly. The young men have gone to that pitch of daring. They proceeded by night. We soiled three years. We consider the property of our friends our own. They are of good lineage. They accuse me of treachery. The man has been condemned to death. They took the woman by the hair. He gave me some bread. The Athenians made Sicily their own. You have obtained a mortal body, but an immortal soul. The general ravaged the land. Do you enjoy pleasures moderately?

LESSONS IN ITALIAN GRAMMAR.—No. XLVIII.

THE PREPOSITION.

THE Preposition is a word placed before the nouns and pronouns which it governs, and before some verbs, to connect words one with another, and to show the relation between them.

Denoting the Cause and Means.

Prepositions.	Examples.
Attèso, per cagióne, considering, on account of, owing to.	*Attèso il cattivo témpo,* or *per cagióne del cattivo tempo,* on account of the bad weather.
Per mézzo, mediánte, by, by means of, for, on condition.	*Per mézzo della vóstra grázia,* or *mediánte la vóstra grázia,* by means of your favour.
Da, dal, per via, per, by, through.	*E' státa ferita da úna saétta d' óro,* she has been wounded by a golden arrow.
	Tútto fu creáto dálla paróla di Dio, every thing has been created by the word of God.
	Andáre a Nápoli per Róma, or *per via di Róma,* to go to Naples through Rome.

Denoting the Object.

Vérso, to, towards.	*Caritatévole vérso i póveri,* charitable to the poor.
Per, for.	*Párlo per vói,* I speak for you.
Circa, about, concerning, touching.	*Circa a quest' affáre,* concerning that affair.

Denoting Opposition.

Contro or *cóntra,* against.	*Chi può andár cóntro,* or *cóntra la, or délla fortúna?* who can go against fortune?
Malgráda, in spite of.	*Malgrádo mío,* in spite of me.
Nonostánte, notwithstanding.	*E' partíto nonostánte il perícolo,* he is gone, notwithstanding the danger.

Denoting Order.

Anánti or *prima,* before.	*E'gli arrivò anánti di me,* he arrived before me.
	Prima délla guérra, before the war.
Dópo, after.	*E'gli entrò dópo me,* he came in after me.
Dietro, behind.	*Dietro all' úscio,* behind the door.
Fra, between.	*Fra due montágne,* between two mountains.

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Denoting Place.

A, at.
In, in or into.
Da, from.
Sótto, under.
Sópra, on or upon.
Vérso, towards.

Andáre a Parigi, to go to Paris.
Andrò in campágna fra dúe settimáne, I will go into the country in a fortnight.
Allontanársi da Róma, to remove from Rome.
Sótto il létto, under the bed.
Sópra la távola, on the table.
E'gli córre vérso me, he runs towards me.

Denoting Separation.

Eccétto, fuorchè, sálvo, tránne, tráttone, except.
Sénza, without.

Tutto è perdúto eccétto l'onóre, all is lost exeept honour.
Senza dúbbio, without fault.

Denoting Union.

Con or *col*, with.
Duránte, in témpo, during.
O'ltre, besides
Secóndo, confórme, according to.

Venite con me, come with me.
Duránte la guérra, or *in témpo di guérra*, during the war.
O'ltre di ciò, besides that.
Mi régolo secóndo le circostánze, I act according to circumstances.

THE CONJUNCTION.

The Conjunction is a word used to connect one word with another, and sentences with sentences.

The Comparative.

Cóme, as
Nel módo che, just
Similménte, likewise
In óltre, besides

The Adversative.

Ancorchè, benchè, comechè, though
Tuttavía, púre, per áltro, yet
Ma, but
Se non, unless
Non di ménо, nondiméno, nevertheless
Perciò, per quésto, therefore
Non per tánto, not however

The Disjunctive.

O o, sia che, either, or
Oppúre, o púre, ossía, o sia, ovvéro, or

The Causal.

A fine, affine, in order
A fine che, affinchè, acciò che, acciocchè, in order that
A cagióne, on condition
Perchè, imperciò che, because
Pósoia che, since
Per, for
Perocchè, perciò che, therefore

The Conclusive.

Così, thus
Laónde, therefore
Di mániera che, so that
In sómma, in short
O'nde, dúnque, adúnque, then
I'er ciò, for this
E così, and so
Per la quál cósa, wherefore
Per tánto, in the mean time

The Conditional.

A condizióne che, con pátto che, on condition that
Ben intéso che, provided
Dátto chey pósto che, suppose
In cáso che, in case that
Quándo, when
Se, if
Da che, poichè, pósoia che, since
Ogni vólta che, whenever
Altrimènte, otherwise

The Transitive.

Ancóra, di più, yet
Altresì, but
Eziandío, also
In óltre, besides
Appresso, after
Oltracciò, óltre che, besides that

THE INTERJECTION.

The Interjection is a word which serves to express the different affections of our mind.

They may be divided as follows:—

For Admiration.

Oh! oh! oh! oh!
Ah! ho!
Può éssere! possíbile! is it possible!
Che! what!
Cóme! how!

For Aversion, Contempt, and Disgust.

Oh vergógna! fie, for shame!
Oibò! O fie!
Eh via! puh! foh! pish!
Andáte, andáte! go, go!
Deh! eh!

For Affliction or Grief

Aime! omè! oimè! ohimè! áhe lásso! lasso! lásso me! alas!
O Dio! O God!
Ah Signóre! ah Lord!
Ah! áhi! ai! óhi! oh! ah!
Mísero me! meschino me! dolénte me! unfortunate that I am!

For Derision.

Oibò! ciáncie! fiddlestick!
Via via! pshaw!

For Fear.

Dio mi benedica! Dio mi aiúti! misericórdia! God bless me!
Dio buóno! oh che giórno! lack-a-day!
Gran Dio! good heaven!
Oh Dio! oh heaven!
Omè! alas!
Sta! atop!

For Joy and Desire.

Oh! ah! O! oh!
Béne! well!
Buóno! good!
Ah! ah! ah! ah!
Ah! ah!
Viva, viva! eh viva! evviva! long live!
O che allegrézza! allegrézza, allegrézza! oh, what joy!

For Approbation or Applause.

Bène! well!
Va béne! very well!
Così! so!
Sì! yes!
Mi piáce! very well!

Vita! eh vita! huzza!
Brávo! bravíssimo! bravo!
Buóno! good!

For Encouraging.

Su présto! via! su via! suasu! orsu! animo! come on!
coma then!
Sù, sù! come, come!
Animo su! cheer up!
Coraggio! courage!

For Surprise.

Cáppari! cáppita! cappitína! cáuchero! cáuchita! heyday!
Cóme! how so!
Oh! oh!
Ah! ah!
Per bácco! upon my word!

For Calling.

E'ia! oh, sh! halloo!
E'hi! Olà! here!
Al fuóco! fire!
Aiúta! help, help;
All' arméi! to arms!

For Warning.

Badáte! guárda! la'rgo, la'rgo! ghe, ghe! take care!
E'cco! écoti! behold! lo!
A cói! a cói! stand away!
A'lto! halt!
Via! sia! away! away!
Sénti! béli! adágio! softly!

For Salutation.

Sa'lve! salvéte! hail!

For Silence.

Sta, sta! zitto! tacíte! peace there!
Silénzio! chi'to! silence!

LESSONS IN SPANISH.—No. XVIII.

COMPARATIVES AND SUPERLATIVES, ETC.

THERE are some irregular comparatives; as, *mayor*, greater; *mejor*, better; *menor*, smaller; *peor*, worse.

As the superlative-relativa is formed by placing the article before the comparative, of course *el mayor* means the greatest; *el mejor*, the best; *el menor*, the least; *el peor*, the worst.

There are some irregular superlatives; as, *máximo*, greatest; *óptimo*, best; *mínimo*, least; *pésimo*, worst; *ínfimo*, lowest.

There are some superlatives in *ísimo* not regularly formed; as, *bonísimo*, very good; *novísimo*, very new; *fortísimo*, very strong; *fidelísimo*, very faithful; *sapientísimo*, very wise; these being the superlatives of the adjectives *bueno, nuevo, fuerte, fiel, sábio*.

There are a few superlatives otherwise irregular; as *paupérrimo*, very poor; *misérrimo*, very miserable; *integérrimo*, very honest; *celebérrimo*, very celebrated; *salubérrimo*, very salubrious; *libérrimo*, very free.

The superlative of the above adjectives can also be formed with *muy*; as, *muy grande*, very great; *muy probre*, very poor; *muy bueno*, very good, etc. And such as do not already end in *ísimo* or *érrimo*, can have their regular form in *ísimo*; as, *malísimo*, very bad; *pequísimo*, very small, etc.

With political or other titles of dignity, *muy* before an adjective expresses somewhat less than the termination *ísimo* affixed to it; thus, *muy ilustre*, very illustrious, is less than *ilustrísimo*, most illustrious.

When a superlative-relativo follows the noun to which it refers, it is sufficient that the article be used before the noun, and not repeated before the superlative; as,

Los Catalanes son los pueblos mas industriosos de España, the Catalanians are the people most industrious of Spain.

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In English we should render the latter clause of the above example, the most industrious people in Spain.

One noun can be compared with another in the same manner as adjectives; as,

Juan es mas niño que su nieto, John is more (of a) child than his grandson.

In forming a comparison, in affirmative sentences, *de* is used instead of *que* before an adjective of quantity or number, or before the pronouns what or that which, expressed or understood; as,

Mi hijo tiene mas de seis años, my son is more than six years old.

Juan tiene mas de lo que necesita, John has more than what he needs.

These sentences rendered literally would be, "my son has more *of* six years;" and "John has more *of* what he needs."

If the sentence be negative, *de* or *que* may either of them be used before an adjective of quantity or number, or the pronouns what or that which; as,

Mi hijo no tiene mas que (or *de*) *seis años*, my son is not more than six years old.

When the adjective is placed after a proper name as a distinguishing epithet, such as "Torquin the Proud," the article precedes it in Spanish as in English; as,

Alexandro el Magno, Alexander the Great.

Guzman el Bueno, Guzman the Good.

Numeral adjectives of order form an exception to the above rule; as,

Cárlos Doce, Charles the Twelfth.
Francisco Primero, Francis the First.

The preposition *de* is generally used after an adjective or participle which is followed by a noun expressive of the cause, manner, means, or instrument, and also after adjectives denoting distance; as,

Agudo de ingénio, sharp in intellect.
Apurado de médios, exhausted in means.
Agéno de verdad, foreign to truth.
Bajo de cuerpo, low in stature.
Boto de punto, blunt at the point.
Cortido del sol, tanned by the sun.
Dotado de ciéncia, endowed with learning.
Escaso de médios, limited in means.
Impelido de la necessidad, impelled by necessity.
Molido de andar, fatigued with walking.
Sordo de un oido, deaf with one ear.
Pálido de miedo, pale with fear.
Defectos comunes de su juventud, faults common to his youth.
Ancho de boca, wide in the mouth (wide-mouthed).
Angosto de manga, narrow in the sleeve (narrow-sleeved).
Blanco de cutis, white in skin (white-complexioned).
Pálido de semblante, pale in the face (pale-faced).
Aprobado de cirujano, approved as a surgeon.

The preposition *in* after a superlative is to be rendered into Spanish by *de*; as,

Los mas sábios hombres del mundo, the wisest men in the world.

Tanto, and not *tan*, is used before a noun in comparisons of equality; as,

María tiene tanta prudencia como Juana, Mary has as much prudence as Jane.

LIST OF NUMERALS.

The numeral adjectives are divided into cardinal and ordinal. The cardinal numerals express numbers; as one, two, three; and the ordinal numerals express order or rank; as first, second, third.

There are also some numeral nouns, such as the collective numbers, *una docena*, a dozen; *una veintena*, a score; and the fractional numbers, *la mitad*, the half; *un cuarto*, a fourth.

The following is a list of the cardinal and ordinal numeral adjectives:—

Cardinal Numbers.	Ordinal Numbers.
Uno, una, one.	*Primero*, first.
Dos, two.	*Segundo*, second.
Tres, three.	*Tercero*, third.
Cuatro, four.	*Cuarto*, fourth.
Cinco, five.	*Quinto*, fifth.
Seis, six.	*Sexto* or *sesto*, sixth.
Siete, seven.	*Séptimo*, seventh.
Ocho, eight.	*Octavo*, eighth.
Nueve, nine.	*Noveno* or *nono*, ninth.
Diez, ten.	*Décimo*, tenth.
Once, eleven.	*Undécimo*, eleventh.
Doce, twelve.	*Duodécimo*, twelfth.
Trece, thirteen.	*Décimo tércio*, thirteenth.
Catorce, fourteen.	*Décimo cuarto*, fourteenth.
Quince, fifteen.	*Décimo quinto*, fifteenth.
Diez y seis, sixteen.	*Décimo sesto*, sixteenth.
Diez y siete, seventeen.	*Décima séptimo*, seventeenth.
Diez y ocho, eighteen.	*Décimo octavo*, eighteenth.
Diez y nueve, nineteen.	*Décimo nono*, nineteenth.
Veinte, twenty.	*Vigésimo*, twentieth.
Veinte y uno,* twenty-one.	*Vigésimo primo*, twenty-first.
Veinte y dos, twenty-two.	*Vigésimo segundo*, twenty-second.
Veinte y tres, twenty-three.	*Vigésimo tércio*, twenty-third.
Veinte y cuatro, twenty-four.	*Vigésimo cuarto*, twenty-fourth.
Veinte y cinco, twenty-five.	*Vigésimo quinto*, twenty-fifth.
Veinte y seis, twenty-six.	*Vigésimo sesto*, twenty-sixth.
Veinte y siete, twenty-seven.	*Vigésimo séptimo*, twenty-seventh.
Veinte y ocho, twenty-eight.	*Vigésimo octavo*, twenty-eighth.
Veinte y nueve, twenty-nine.	*Vigésimo nono*, twenty-ninth.
Treinta, thirty.	*Trigésimo*, thirtieth.
Cuarenta, forty.	*Cuadragésimo*, fortieth.
Cincuenta, fifty.	*Quincuagesimo*, fiftieth.
Sesenta sixty.	*Sexagésimo*, sixtieth.
Setenta, seventy.	*Septuagésimo*, seventieth.
Ochenta, eighty.	*Octogésimo*, eightieth.
Noventa, ninety.	*Nonagésimo*, ninetieth.
Ciento, a hundred.	*Centésimo*, hundredth.
Docientos, two hundred.	*Docentésimo*, two hundredth.
Trecientos, three hundred.	*Trecentésimo*, three hundredth.
Cuatrocientos, four hundred.	*Cuadragéntesimo*, four hundredth,
Quinientos, five hundred.	*Quingentésimo*, five hundredth.
Seiscientos, six hundred.	*Sexentésimo*, six hundredth.
Setecientos, seven hundred.	*Septengentésimo*, seven hundredth.
Ochocientos, eight hundred.	*Octogentésimo*, eight hundredth.
Novecientos, nine hundred.	*Nonagentésimo*, nine hundredth.
Mil, a thousand.	*Milésimo*, thousandth.

The cardinal numbers for eleven hundred, twelve hundred, two thousand, three thousand, etc., are *mil y ciento, mil y docientos, dos mil, tres mil;* for a hundred thousand, two hundred thousand, etc., *cien mil, docientos mil*; for a million, two millions, etc., *un millon, dos millones*. *Millon* is not an adjective, but a noun.

Uno is declinable, changing the final *o* into *a* whenever it refers to a feminine noun. All of the cardinal numbers ending in *ientos* form their feminine in *as*; as, *docientas mugeres*, two hundred women. The rest are indeclinable.

All the ordinal numbers change the last *o* into *a* to form their feminine.

Uno drops the last letter when it comes before a noun.

Ciento drops its last syllable when it comes immediately before a noun, but not when any other word comes between it and the noun; thus, *cien soldados* a hundred soldiers; and *ciento y tres soldados*, a hundred and three soldiers.

Primero and *tercero*, among the ordinals, drop the final *o* before a noun.

The cardinal numbers (and not the ordinal) are generally used in Spanish to express order or rank, when the number

* Sometimes found written as one word, as, *veintiuno, veintidos*

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exceeds nine; when under nine, the ordinals are employed; thus,

Enrique Octavo, Henry Eight (the Eighth).	*Tomo diez y ocho*, volume eighteen (the eighteenth).
Cárlos Doce, Charles Twelve (the Twelfth).	*Página septima*, page seventh (the seventh).

In mentioning the days of the month, the Spanish use the cardinal adjectives and not the ordinal, as in English, except in the first day, in which *primero* and not *un* is used; thus,

El primero de Enero, the first of January.	*El tres de Marzo*, the three (third) of March.
El dos de Febrero, the two (second) of February.	*El diez y seis de Mayo*, the sixteen (sixteenth) of May.

In dates where figures are used, the article is omitted, and except the first day of a month, the cardinal numbers are used; as,

Madrid, 1° *de Junio de* 1845, Madrid, June 1st, 1845.	*Paris*, 4 *de Julio de* 1846, Paris, July 4th, 1846.
Lóndres, 27 *de Agosto de* 1847, London, August 27th, 1847.	

The hour of the day is expressed by the ordinal numbers preceded by the definite article, which must in such a case agree with *horas*, hours, understood (unless the hour be one, when it agrees with the singular, *hora*); thus,

¿ Que hora es ? what o'clock is it?	*Son las tres ménos diez minutos*, it is ten minutes before three.
Es la una, it is one o'clock.	*Son las ocho y veinte minutos*, it is twenty minutes after eight.
Son las dos, it is two o'clock.	
Son las diez, it is ten.	

Literally, the above expressions mean, "What hour is it?" "It is the one"—"they are the two"—"they are the ten" "they are the three less ten minutes"—"they are the eight and twenty minutes."

In speaking of the age of persons or things, the verb *tener* is employed in Spanish; as,

Cárlos tiene doce años, Charles is twelve years old.	*El Señor Tournay no tiene cincuenta años*, Mr. Tournay is not fifty years of age.

Literally, "Charles has twelve years," and "Mr. Tournay has not fifty years."

In Spanish it is not said, in expressing measurement, twenty feet high, or ten feet long; but twenty feet of high, or of height, ten feet of long, or of length; as,

La casa tenia sesenta codos de largo, y veinte codos de ancho, y treinta codos de alturo, the house was (had) sixty cubits long, and twenty cubits wide, and thirty cubits in height.	

In comparative sentences, to express difference, in English it may be said, she is taller than her sister *by* the whole head. In Spanish, this sentence would be, *ella es mas alta que su hermana de toda la cabeza*, i.e. she is more tall than her sister *of* all the head.

OF THE PRONOUN.

PERSONAL PRONOUNS.

The personal pronouns of the nominative case, when used, may come either before or after the verb, except the latter be in the imperative mood, or the sentence be interrogative, in which cases the nominative generally follows the verb; as, *viva ella*, may she live; *¿ ha hablado él ?* has he spoken?

As the verb-ending generally indicates of itself the person and number that its nominative must be, the nominative personal pronouns are seldom expressed in Spanish, unless when necessary to distinguish the persons or genders, or to be emphatic, or when a relative pronoun is to follow; as,

Nosotros seramos castigados, y no vosotros, we shall be punished, and not you.	*dos*, he who has money has cares.
El que tiene dinero, tiene cuidados, he who has money has cares.	*El y ella son prudentes*, he and she are prudent.

The pronoun *se*, oneself, is sometimes used with a reflective or reciprocal verb, and then it is to be rendered in English by himself, herself, itself, themselves, or one another, as the sense may require; as,

Ellas se aman, they love themselves (or, they love one another).

The first objective case of all the personal pronouns is also employed with reflective or reciprocal verbs; as,

Nosotros nos amamos, we love ourselves (or, each other).	*Yo no quiero alabarme*, I wish not to-praise myself.
Yo me alabo, I praise myself.	

The pronoun *se* is also frequently used with a verb in the active voice, of the third person singular or plural, to express the passive voice; as,

La casa se quemó, the house was burned (the house burnt itself).

The first objective case of all the personal pronouns is sometimes used with a reflective verb in a passive sense; as,

Yo me admiro, I am surprised (I surprise myself).	*Vosotros os alegrais*, you are rejoiced (you rejoice yourselves).

Strictly speaking, *se* cannot be used in the nominative case, and should therefore always be considered as governed by a verb. Thus, in such sentences as *se dice*, *se cree*, *se piensa*, the literal rendering is, it-says itself, it-believes itself, it-thinks itself, or, it is said, it is believed, it is thought. Still, in translating, it is often more convenient to imagine *se* as an indefinite pronoun of the nominative case, used in the sense of *they*; as, *se dice*, they say, that is, people say; *se piensa*, they think.

Se and other pronouns of the first objective case are often used in Spanish with neuter and active-intransitive verbs reflectively, and in such cases seem redundant in English; as,

De allí se pasó á la ciudad, thence he-passed (himself) to the city.	*Yo me arrepiento*, I repent (myself).
	Se arrepiente, he repents (himself).

Se is sometimes used in the sense of to-him, to-her, to-them, to-you (*i.e.* to your worship). This use of *se* takes place only when another personal pronoun of the objective case and of the third person immediately follows it; as,

Tengo una cuchara; se la daré,* I-have a spoon; I-will-give it to-him.

When, in cases coming under the above rule, the pronoun *se* does not denote with clearness the number or gender of the noun for which it is employed, the second objective is also used; as,

Se lo daré á ella, á ellos, á usted, I-will-give it to-her, to-them, to-you.	*Se la mandó dar á ellos*, he-commanded it to-be-given to-them.

The first objective case of the Spanish personal pronouns is very often to be rendered in English by the preposition "to" and the pronoun; as, to-me, to-you, to-him, to-her, to-them, etc., and it is then equivalent to the second objective, *á mí*, *á vosotros*, *á él*, *á ella*, *á ellos*, etc.; and in some cases some other preposition than "to" is used in rendering the first objective into English; as,

Juan me dijo, John said to-me.	*Se lo agradezco*, I-thank him for-it.
Te lo pido, I-ask it of-thee (or, from-thee).	*Nos lo suplica*, he-beseechas us for-it

The second objective with the preposition *á* is not used, except when the same verb governs two or more pronouns in the objective case, or when it is designed to be distinct or particularly emphatic; as,

Juan dió dinero á él, á ella, y á ti, John gave money to him, to her, and to thee.	John lives, said they to her.
Juan vive, dijeron ellos á ella,	*Yo vi á vosotros y á ellos*, I saw you and them.

* We cannot say *le la daré*, I-will-give it to-him, but *se la daré*.

To add more clearness or strength to a sentence, both objective cases of pronouns are often employed; the second objective case then being placed either before the first objective or else after the verb, except the first objective comes after the verb (as in the case of infinitives, gerunds, and imperatives), when the second objective must come after the first; as,

A mi me dijeron or *me dijeron á mí*, they told me.
Decirme á mí, to-tell me.
Diciéndole á ella, telling her.
Dime á mí, tell me.

When the sentence may contain a noun in the objective case governed by the preposition *á*, a pronoun of the second objective case is often used in Spanish, and is not to be translated in English; as,

A Dios nádie le vió jamas, God no-man saw (him) ever; i.e. no-one ever saw God.

Mismo, meaning *same* or *self*, is often used with the nominative personal pronouns; thus, *yo mismo*, I myself; *nosotros mismos*, we ourselves, etc.; and also with the second objective; and must always agree in gender and number with the noun to which the pronoun refers; as,

¿Qué dices de tí mismo? what sayest-thou of thyself?
La muger hablará por sí misma, the woman will speak for herself.

Mismo is often used with nouns also; as *lo misma María*, Mary herself; *los mismos soldados*, the very soldiers, or, the soldiers themselves.

When by the pronoun *it* is meant anything to which we cannot apply a gender, *ello* is used. Its first objective *lo* is employed by the same rule; thus if it be said, "he has been told to love his enemies, and he does *it*," the pronoun *it* refers to the clause of the sentence, "to love his enemies," and of course has no gender. In such a case, *lo* (not *le* nor *la*) would be used.

Lo is used in Spanish for *so* in English, when the latter means *it*; as,

Vmd. piensa que ella es rica, pero no lo es, you think that she is rich, but she is not so.
Si lo es, if it be so.
Diego lo hace, James does so.

Lo is often used for *le* when the latter refers to a masculine noun and is immediately governed by a verb (though this use of *lo* is not grammatically correct); as,

Espero que lo vée en perfecta salud, I hope that I see him in perfect health.

THE PECULIAR USE OF OTHER PRONOUNS.

The demonstrative pronouns *este* and *aquel* are often used without any noun, and in such a case they have the sense of this-one, and that-one, or the-one; as,

Este es aquel de quien yo dije, this-one is the-one of whom I said; or, this is he of whom I said.

Todo aquel que is used in the sense of—every one who; as,

Todo aquel que bebe de esta agua; every one who drinks of this water.

Quien often means—he-who, she-who, one-who; and *quienes*, they-who; as,

Quien calla otorga, he-who is silent, consents.
María fué quien lo dijo, Mary was she-who said it.
Porque los enseñaba, como quien tiene autoridad, for he-taught them as one-who has authority.

Such expressions as, it is I, it is thou, it is he, it is she, it is we, etc., are rendered in Spanish by I am, thou art, he is, she is, we are, etc; as,

Yo soy, it is I.
Ella es, it is she.
Ellos son, it is they.
¿Es usted? is it you?

De él, de ella, de ello, de este, etc., were anciently written *dél, délla, déllo, déste*.

De and *él*, and *á* and *él*, are contracted into *del* and *al* when serving as the antecedent of the relative pronoun *que*; as

Del que sigue, of-that which follows.
Pedro dió el libro al que vimos, Peter gave the book to-him whom we saw.

OF THE VERB.

AGREEMENT OF THE VERB WITH ITS SUBJECT.

The verb agrees, in number and in person, with its subject or nominative, expressed or understood; as,

Soy general, I am a general.
Ella amo la verdad, she loves the truth.
Los Americanos aman las riquezas, the Americans love riches.

When a verb has two or more subjects, each in the singular, it is put in the plural; as,

Mi padre y mi madre me aman, my father and my mother love me.
Pedro ó Diego vendrán,* Peter or James will-come.

When a verb has two or more subjects of different persons, it is put in the plural, and agrees with the first person in preference to the other two; as,

Mi hermano y yo estamos malos, my brother and I (*i.e.* we) are ill.
Tú y yo estamos buenos, thou and I (*i.e.* we) are well.

If the second person should be used with the third, without any first person, the verb must be in the second person plural; as,

Tú y ella estais buenas, thou and she (*i.e.* you) are well.

When a relative pronoun is the subject of the verb, the latter must agree, in person and number, with the noun or pronoun to which the relative relates; as,

Yo soy que hablo contigo, it is I who speak with-thee.
Vosotros que sois sabios, ye who are wise.

A collective noun, taken in a general sense, that is, a noun representing the whole of the persons or things mentioned, requires the verb to be of the singular number; as,

El ejército de los Caldéos persiguió al rey, the army of the Chaldeans pursued the king.

A subject which is a collective noun, taken in a partitive sense, that is, representing a part of the whole of the collective noun, and conveying plurality of idea, requires the verb to be in the plural; as,

Parte creian lo que les decia, y parte no lo creian, part believed what he told them, and part believed it not.

This last rule is not always followed even by the best Spanish authors.

In cases in which a verb appears to have two subjects, it must agree with that noun to which it seems more particularly to belong; as,

Los gages del pecado son muerte, the wages of sin are (is) death.

* This is different, as will be perceived, from the rule in English syntax, which requires two singular nouns connected by a disjunctive conjunction, to have the verb agree with them in the singular form.

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ELIJAH'S INTERVIEW.

On Horeb's rock the prophet stood,—
The Lord before him passed;
A hurricane in angry mood
Swept by him strong and fast!
The forest fell before its force,
The rocks were shivered in its course.
God was not in the blast;
'Twas but the whirlwind of his breath,
Announcing danger, wreck, and death.

It ceased. The air grew mute,—a cloud
Came muffling up the sun,
When through the mountain, deep and loud,
An earthquake thundered on;
The frighted eagle sprang in air,
The wolf ran howling from his lair;
God was not in the storm:
'Twas but the rolling of his car,
The trampling of his steeds from far.

'Twas still again,—and nature stood
And calmed her ruffled frame;
When swift from heaven a fiery flood
To earth devouring came;
Down to the depth the ocean fled,—
The sickening sun looked wan and dead;
Yet God filled not the flame:
'Twas but the terror of his eye,
That lightened thro' the troubled sky.

At last a voice so still and small,
Rose sweetly on the ear;
Yet rose so shrill and clear, that all
In heaven and earth might hear;
It spoke of peace, it spoke of love,
It spoke as angels speak above;
And God himself was there:
For oh! it was a *father's* voice,
That bade the trembling heart rejoice.

Thomas Campbell.

AFTER THE BATTLE.

Night closed around the conqueror's way,
And lightnings show'd the distant hill,
Where those who lost that dreadful day
Stood, few and faint, but fearless still!
The soldier's hope, the patron's zeal,
For ever dimm'd, for ever cross'd—
Oh! who shall say what heroes feel,
When all but life and honour's lost!

The last sad hour of freedom's dream,
And valour's task, moved slowly by,
While mute they watch'd, till morning's beam
Should rise and give them light to die!—
There is a world where souls are free,
Where tyrants taint not nature's bliss;
If death that world's bright opening be,
Oh! who would live a slave in this?—*Moore.*

CHRONOLOGY.—No. XI.

A.D.
1756.—War between France and England declared.
The Foundling Hospital established in London.
1757.—In India Colonel Clive defeated Surajah Dowlah, and raised Jaffir Ally Cawn to the dignity of Nabob.
The English defeated by the French at Hastenbeck.
Calmet died.
The battle of Prague.
The identity of electric fire and lightning discovered by Dr. Franklin.
Admiral Byng, having failed to relieve Minorca from a French attack, condemned by a court-martial to be shot.
1758.—The celebrated Bridgewater Canal commenced by Brindley.
Establishment of the Magdalen Hospital, London, by Dr. Dodd and other philanthropists.
Minden captured by the French.
Capture of Senegal by the English.
A.D.
1759.—Death of General Wolfe at the siege of Quebec.
1760.—Death of George II., and accession of George III.
Sir Eyre Coote, after defeating the French, captures Arcot.
Earl Ferrars executed at Tyburn for murder.
The English, after several engagements with the French, complete the conquest of Canada by the capture of Montreal.
Commencement of the first Blackfriars Bridge.
The kingdom of Mysore founded by Hyder Ali.
1761.—Belleisle captured.
Austrians defeated by the Prussians in Silesia.
The Princess Charlotte (Queen of George III.) arrived in England.
Dr Hoadley died.
Pondicherry (East Indies) surrendered to the English.
1762.—Island of Granada, in the West Indies, surrendered to the English.
Defeat of the French by the English at Grebenstein, in Germany.
Havana captured by the English.
Lady Mary Wortley Montague died.
Manilla captured by the English.
1764.—Stanislaus Poniatowski elected King of Poland.
William Hogarth died.
John Wilkes expelled the House of Commons.
1765.—Surajah Dowlah defeated by General Clive, and the British Government established in Bengal.
Dissatisfaction in the North American Colonies, owing to the passing of the American Stamp Act, which was repealed the following year.
Bengal ceded to the East India Company.
1766.—Goldsmith's "Vicar of Wakefield" published.
1768.—Captain Cook embarks on his first voyage of discovery.
The Royal Academy of Arts instituted in London.
Triumph of the British over Hyder Ali in India.
1769.—Birth of Napoleon and the Duke of Wellington.
1772.—Royal Marriage Act passed.
Captain Cook starts on his second voyage.
1773.—Revolt in the American Colonies. The tea taxed by the English Government seized and destroyed.
1774.—First American Congress held at Philadelphia.
Oliver Goldsmith died.
Herschel, a musician at Bath, commences his astronomical labours, and constructs his first telescope.
Louis XVI. ascends the throne of France.

ANSWERS TO CORRESPONDENTS.

J. F.—You may make very good tracing paper for immediate use by rubbing a little turpentine over ordinary tissue paper.

J. F. K.—A good sympathetic ink may be made of carbonate of iron; it turns blue if washed with a prussiate of potash. Ink made of green vitriol turns black if washed with a decoction of galls.

A Young Student.—The tribunes of the people in ancient Rome were magistrates chosen from the commonalty, as the defenders of the liberties of the people against the oppressions of the great. Their number was at first two, then five, and afterwards ten. In course of time their rule became tyrannical. They were suppressed by Julius Cæsar.

M. W.—In the choice of friends you cannot do better than follow the advice of Dr. Blair. He says, "We should ever have it fixed in our memories that by the character of those whom we choose for our friends our own is likely to be formed, and will certainly be judged of by the world. We ought, therefore, to be slow and cautious in contracting intimacy, but when a virtuous friendship is once established, we must ever consider it as a sacred engagement."

Geologist.—Many of the igneous rocks were undoubtedly deposited from water in a stratified form, and have been subsequently changed and caused to assume their present appearance through the agency of heat. On the intensity of the heat below the earth's surface would depend the thickness of the crust. All melted matter has a tendency to expand and rise; and, accordingly, the melted matter within the earth acquires an elevating force, which causes the mass that lies on the surface to swell out in the form of a curve. In this process the heat produces many cracks and fissures. If we were to imagine the crust of the earth cut through, so that we could see the face of it, the cracks and fissures would be seen with great regularity; the body of the crust between the fissures being in wedge-like forms, with the points cut off. You will find this matter very fully taken up in our Lessons in Geology.

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ON PHYSICS, OR NATURAL PHILOSOPHY. No. LXXIV.

(Continued from page 322.)

DYNAMICAL ELECTRICITY.

APPLICATION OF ELECTRICITY TO MEDICAL PURPOSES.

The first applications of electricity to medical purposes date from the discovery of the Leyden jar. Nollet and Boze appear to have been the first philosophers who thought of this application of electricity, and in a short time electrical puncture and friction became a universal panacea; but it must be confessed that the first attempts did not answer the expectations of the experimenters.

Immediately upon the discovery of dynamical electricity, Galvani proposed the application of it to the art of healing, or, as it is technically termed, therapeutics. Since that time many philosophers and physiologists have taken up the subject, yet it still remains in a state of great uncertainty. The cases in which electricity ought to be employed, the real effects of electricity, and the best mode of applying it, are all matters upon which great doubt exists. Practitioners, however, are agreed upon one point, and that is, in preferring the use of currents to statical electricity. They also consider interrupted currents preferable to continuous ones, at least in nearly all cases. Besides these points there are others to be considered, as, *e.g.*, whether the currents from batteries should be preferred to those of induction, and whether these latter should be of the first or the second order, the effects of the two kinds being different.

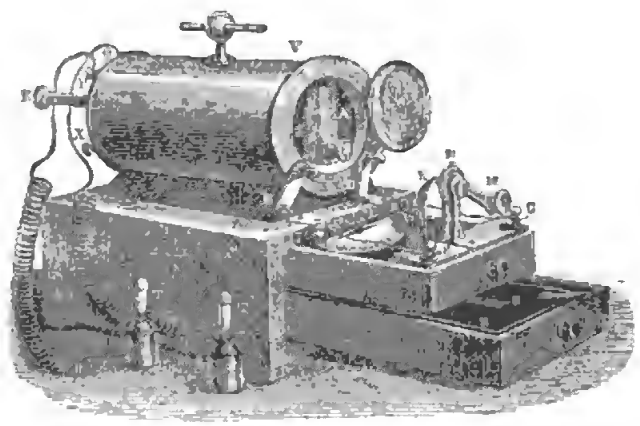
Currents of induction, although very intense, have a very feeble chemical action, so that, when they pass through the organs, they do not produce the calorific effects of currents from the battery, and consequently do not tend to cause the same disorganisation. Further, for electrifying the muscles of the face, currents of induction should be preferred, because Dr. Duchenne, of Boulogne, who has made so many experiments upon the medical applications of electricity, has proved that these currents act very feebly upon the retina, while currents from the battery act much more forcibly upon it, so violently, indeed, as to be seriously injurious, and melancholy accidents have resulted from their use. With regard to induced currents of different orders, Dr. Duchenne states that, while an induced current of the first order produces strong muscular contractions, but has little effect upon the cutaneous sensibility, an induced current of the second order, on the contrary, increases the cutaneous sensibility to such a pitch that it ought not to be employed in the case of persons whose skin is very irritable.

From what has been stated, we may conclude that currents ought not to be applied to medical purposes except by persons who have a thorough knowledge of their different properties. Further, they ought to be employed with great moderation as well as prudence, for, if their action is continued too long, serious accidents may result. M. Matteucci, in his lectures upon the physical phenomena of living bodies, thus expresses himself:—"It is always necessary to begin by using a very feeble current. This precaution appears to me now more important than I thought it before. I saw a paralytic seized with convulsions of really a tetanic character under the action of a current furnished by a single element. Be careful never to prolong the passage of the current, especially if it be a powerful one. Employ the interrupted rather than the continuous current; but after twenty or thirty shocks, at most, let the patient rest for a few minutes."

Various apparatus have been invented for applying interrupted currents—obtained by the induction of currents, the induction of magnets, or the battery—to medical purposes. The first apparatus appears to have been constructed at Paris by Dr. Rognetta, an Italian philosopher. Since that, Messrs. Masson, Dujardin, Gloesner, Breton and Duchenne have devised various apparatus of this sort. We will give descriptions of three of them, two invented by Dr. Duchenne, one producing an induced current of the first order, and the other an induced current of the first or second order, as may be desired; and the third, invented by M. Pulvermacher, producing an ordinary battery current, but interrupted and possessing great intensity

Dr. Duchenne's Electro-Voltaic Apparatus.—This apparatus

Fig. 480



consists of a bobbin with two wires, like that which we described when speaking of currents of induction, fig. 459, and enclosed in a case v, fig. 480. This bobbin is fastened on to a wooden box, in which there are two drawers. The first contains a compass, which performs the part of a galvanometer, and serves to measure the intensity of the inducing current by the deflection which it produces in the needle. The second contains a carbon pile or battery, arranged in such a way as to occupy the least possible space. The zinc element z is itself in the form of a small drawer, in which is a solution of sea salt and a rectangular plate o of well-burnt coke, like that in the Bunsen battery. In the central part of the coke is a small cavity, into which is poured a small quantity of nitric acid, which is absorbed. Of the two copper plates L and N, the first is connected with the zinc, and represents the negative pole, and the second with the coke, and represents the positive pole. When the drawers are closed, the poles L and N are in contact with the lower ends of the copper rods R and C. From these two last proceed two copper wires RP and ON, which conduct the current to the parts R and C, the former of which is moveable. When it is lowered, the current passes; but when it is raised, as in the figure, the current is interrupted.

As the induced current does not come into existence except at the moment when the inducing current begins or ends, it is necessary that the latter should be subject to continual intermissions. In Dr. Duchenne's apparatus, these intermissions

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may be rapid or slow at pleasure. For rapid intermissions, the current passes into a piece of soft iron A, which oscillates very quickly under the influence of a soft iron horse-shoe placed in the axis of the bobbin, and temporarily magnetised when the current is passing. It is this part A which, by its motion backwards and forwards, interrupts and re-establishes the inducing current, and consequently gives rise to the induced current.

For slow intermissions, the oscillating piece is fastened by means of a small rod G; then, instead of passing the current through the part A, it is passed through a spring K, and through the teeth of a wooden wheel D, the teeth being of metal, and connected with the support I and the knob C. On turning the winch M, the current is interrupted every time the spring K ceases to touch a tooth; and as there are four teeth, there are four intermissions for each revolution, which enables one, by turning faster or slower, to vary at pleasure the number of intermissions, and consequently of shocks, in a given time.

To communicate the shocks, bring the ends of the induction wire to two knobs P and Q, to which are fastened two long copper wires covered with silk, and terminating in two exciters—or, as they are usually called in this country, discharging-rods or dischargers—with glass handles T T. It is these dischargers which are applied to the organs in such a manner as to pass the current to whatever part of the body is desired.

Lastly, the apparatus has a *graduator*, intended to vary the intensity of the current. This graduator consists of a hollow red copper cylinder, which surrounds the bobbin, and is capable of being drawn out more or less, like a drawer, by means of a graduated rod R. The intensity is greatest when the graduator is drawn out so as entirely to expose the bobbin, and it is least when it completely conceals it. This influence of the cylindrical envelope, which was observed by Messrs. Dore and Duchenne, is attributed to currents of induction which are produced in its substance.

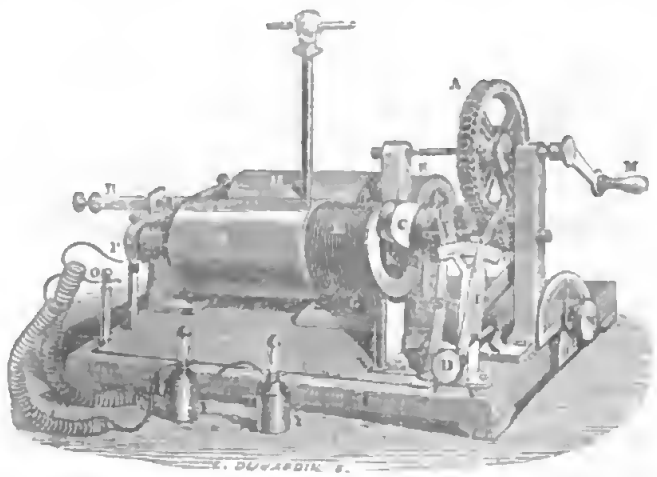
Dr. Duchenne's Electro-Magnetic Apparatus.—Dr. Duchenne has also employed in his practice a second apparatus, in which he does not make use of the battery, but of the inducing action of a powerful magnet, in order to obtain a current, as is the case with Clarke's apparatus, of which we have given an account. The magnet K K, fig. 481, consists of two branches, united at their posterior extremities by a soft iron armature. In front of their anterior extremities there is an armature C, which is also made of soft iron, free to turn upon a horizontal axis, which is set in motion by the pinion O of a large wheel with a chain round it, and a winch M.

About the two branches of the magnets is wound a copper wire covered with silk, and intended to receive the induction of the magnets. Then upon the first wire is wound a second K K, intended to receive the induced current of the second order.

When a rotatory motion, more or less rapid, is communicated to the part C, as it is magnetised each time that it passes the poles of the magnets K K, it exercises upon them, through the diffusion of the magnetism, a reaction which produces a current of induction of the first order in the first wire, while this latter at the same time developes in the wire K K an induced current of the second order. These currents may be obtained separately by means of a system of parts P or Q, which are each double, but only one of which, for each system, is visible in the figure. The current then passes along copper wires wound in a spiral form upon two dischargers T T, which are held in the hand by two glass handles, and are then taken to the patient to pass the current through him. With regard to the intermissions necessary for the formation of induced currents, they are produced by means of a cylinder B and a series of parts S I D F, into the detailed description of which we cannot now enter.

Lastly, the intensity of the shocks is regulated by means of a button screw N, which serves to bring the part C nearer to or farther from the magnets. But the principal regulator consists of two red copper cylinders R R, which surround the bobbins, and are capable of covering a larger or smaller portion of the bobbins, according to the direction given to a drawer R, to which they are attached. The shocks have the least intensity when the cylinders entirely cover the bobbins, and the greatest when they are entirely uncovered. This is to be

Fig. 481.



explained by the currents of induction which are developed in the mass of the cylinder.

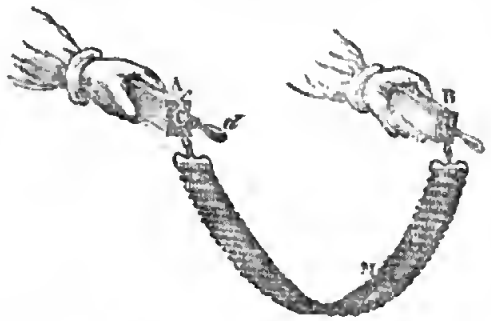
As it is not in our power to describe at length the medical effects of these apparatus, we will simply observe that they have been particularly effective in cases of paralysis.

Pulvermacher's Galvanic Chain.—M. Pulvermacher has recently devised a new sort of pile, which is remarkable for its great tension, and the facility with which it may be used. This pile, which bears a strong resemblance in the principle of its construction to the column pile described in a previous lesson, is represented in fig. 482, at the moment when the shock is communicated. Fig. 483 represents the details of its construction.

It consists of a series of small wooden cylinders M and N, upon which are wound a copper and a zinc wire by the side of one another, but without touching. At each of its ends, the zinc wire *a b* of the cylinder M is joined on to the copper wire of the cylinder N by means of two small copper rings inserted in the wood. Then the zinc of the cylinder N is in the same manner united to the copper of the third cylinder, and so on throughout, in such a manner that the zinc of one cylinder always forms with the copper of the next one a couple exactly like those of the column pile. The whole thus forming a sort

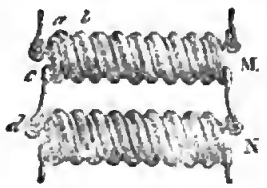
of chain, which is held at the two ends, this chain is dipped in a vessel containing vinegar more or less diluted with water. The small wooden cylinders being porous, then imbibe part of the liquid, and act like the acidulated wet cloths of the column

Fig. 482.



pile; and the chemical action produced between the zinc and the acid gives rise to a current, the intensity of which is directly proportional to the number of the couples. With a chain of twenty couples, very violent shocks are given.

Fig. 483.



To interrupt the current, which is necessary in order to obtain shocks, M. Pulvermacher employs two methods. First, he makes use of two armatures A and B, fig. 482, to which are attached the two poles of the pile M. The armature B merely serves to establish a closer contact with the hand, but the armature A, which answers the same purpose, also serves for the interruption of the current. For this purpose, it contains small clock-work machinery, which makes an oscillation of such a kind that sometimes the pole of the pile is connected internally with the side of the armature, and sometimes is not. The rapidity of the oscillations, and consequently the number of shocks, may be made to vary within certain limits by means of a small regulator *c*, moved by the hand. Lastly, the motion of the clock-work is produced by winding it up with a key *d*, which also serves as the handle of the armature.

M. Pulvermacher also interrupts the current by means of a small apparatus represented in fig. 484. It consists of a glass

Fig. 484.



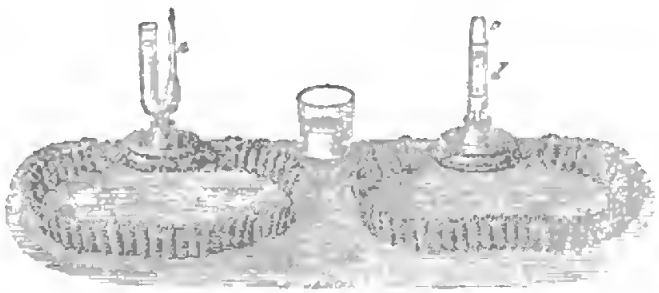
tube, with two copper ferrules at the ends, and two copper rods *m* and *n*. From one of these ferrules proceeds a very flexible metallic wire, terminating in a small star-shaped button. This tube being placed in the current, and the slightest motion being sufficient to make the metal wire in the tube oscillate, every time the part *o* touches the ferrule of the end *n*, the current passes, and a shock is produced. This mode of interruption is adopted when the chain is placed at rest upon a diseased limb, because the slightest movement makes the part *o* oscillate.

Physical Effects of the Galvanic Chain.—A galvanic chain of sixty couples has a tension strong enough to decompose water, even without its being acidulated. Fig. 486 shows how the experiment is arranged. At the bottom of a glass tube *d*, rather large and full of water, are two platinum wires connected with the poles of the battery. A second tube *c*, which is not fixed, is placed in the former, and is raised as the oxygen and hydrogen are liberated.

Fig. 485 represents the same experiment modified, to render it capable of setting fire to the gaseous compound as it is set at liberty. The two platinum wires are placed obliquely in the small branch of a bent tube full of water. This small branch is terminated by a very thin part *a*, at the extremity of which the compound of the two gases is liberated and set on fire, without, however, causing any report inside, because the small branch is quite full of water. This arrangement, which was devised by M. Ruhmkorff, may be evidently applied to more powerful batteries.

Fig. 485.

Fig. 486.



BIOGRAPHY.—No. XXV.

LAURA BRIDGMAN.

A pupil in the Boston Institution for the Blind has attained a wide-spread celebrity through her misfortunes, and through the efforts made by her benevolent instructor, "Principal of that Institution," to redeem her from the appalling mental darkness which the loss in early childhood of the faculties of sight, speech, and hearing, had involved her. As yet, her history is only known through the "reports" made from time to time to the trustees of that institution by Dr. Howe. From these we derive the following information, though not without some regret, that in the modesty which always accompanies exalted worth, he has said so little of his own noble exertions in throwing light upon that darkened spirit. Laura Bridgman was born in Hanover, New Hampshire, on the 21st of December, 1829. She is described as having been a very sprightly and pretty infant, with bright blue eyes. She was, however, so puny and feeble, until she was a year and a-half old, that her parents hardly hoped to rear her. She was subject to severe fits, which seemed to rack her frame almost beyond its

power of endurance, and life was held by the feeblest tenure; but when a year and a-half old she seemed to rally, the dangerous symptoms subsided, and at twenty months old she was perfectly well. Then her mental powers, hitherto stinted in their growth, rapidly developed themselves; and during the four months of health which she enjoyed, she appears (making due allowance for a fond mother's account) to have displayed a considerable degree of intelligence.

But suddenly she sickened again; her disease raged with great violence during five weeks, when her eyes and ears were inflamed, suppurated, and their contents were discharged. But though sight and hearing were gone for ever, the poor child's sufferings were not ended. The fever raged during seven weeks. "For five months she was kept in bed in a darkened room; it was a year before she could walk unsupported, and two years before she could sit up all day." It was now observed that her sense of smell was almost entirely destroyed, and consequently that her taste was much blunted.

It was not until four years of age that the poor child's bodily health seemed restored, and she was able to enter upon her apprenticeship of life and the world.

But what a situation was hers! The darkness and the silence of the tomb were around her; no mother's smile called forth her answering smile; no father's voice taught her to imitate his sounds; her brothers and sisters were but forms of matter which resisted her touch, but which differed not from the furniture of the house, save in warmth and the power of locomotion, and not even in these respects from the dog or cat.

But the immortal spirit which had been implanted within her could not die, nor be maimed nor mutilated; and though most of its avenues of communication with the world were cut off, it began to manifest itself through the others. As soon as she could walk, she began to explore the room, and then the house. She became familiar with the form, density, weight, and heat of every article she could lay her hands upon. She followed her mother, and felt her hands and arms as she was occupied about the house; and her disposition to imitate led her to repeat everything herself. She even learnt to sew a little, and to knit.

Her affections, too, began to expand, and seemed to be lavished upon the members of her family with peculiar force.

But the means of communication with her were very limited; she could only be told to go to a place by being pushed, or to come to one by a sign of drawing her. Patting her gently on the head signified approbation; on the back, disapprobation.

She showed every disposition to learn, and manifestly began to use a natural language of her own. She had a sign to express her knowledge of each member of the family: as drawing her fingers down each side of her face, to allude to the whiskers of one; twirling her hand around, in imitation of the motion of a spinning-wheel, for another; and so on. But although she received all the aid that a kind mother could bestow, she soon began to give proof of the importance of language to the development of human character. Caressing and chiding will do for infants and dogs, but not for children; and by the time Laura was seven years old the moral effects of her privation began to appear. There was nothing to control her will but the absolute power of another, and humanity revolts at this. She had already begun to disregard all but the sterner nature of her father; and it was evident, that as the propensities would increase with her physical growth, so would the difficulty of restraining them increase.

At this time, Dr. Howe fortunately heard of the child, and immediately hastened to Hanover to see her. He found her with a well-formed figure, a strongly marked nervous-sanguine temperament, a large and beautifully-shaped head, and the whole system in healthy action.

Here seemed a rare opportunity of benefiting an individual, and of trying a plan for the educating of a deaf and blind person, which he had formed on seeing Julia Brace, at Hartford.

The parents were easily induced to consent to her going to Boston; and on the 4th of October, 1837, they brought her to the Institution. For a while she was much bewildered. After waiting about two weeks, until she became acquainted with her new locality, and somewhat familiar with the inmates, the attempt was made to give her a knowledge of letters, by the combination of which she might express her idea of the existence, and the mode and condition of existence, of anything. The former would have been easy, but very ineffectual; the latter seemed very difficult, but, if accomplished, very effectual. Dr. Howe determined, therefore, to try the latter. The first experiments were made by taking articles in common use, such as knives, forks, spoons, keys, etc., and pasting upon them labels with their names printed in raised letters. These she felt very carefully, and soon, of course, distinguished that the crooked lines *s p o o n*, differed as much from the crooked lines *k e y*, as the spoon differed from the key in form.

The small detached labels, with the same words printed upon them, were put into her hands, and she soon observed that they were similar to the ones pasted on the articles. She showed her perception of this similarity by laying the label *k e y* upon the key, and the label *s p o o n* upon the spoon. She was here encouraged by the natural sign of approbation, patting on the head.

The same process was then repeated with all the articles she could handle, and she very easily learnt to place the proper labels upon them. It was evident, however, that the only intellectual exercise was that of imitation and memory. She recollected that the label *b o o k* was placed upon a book and she repeated the process, first from imitation, next from memory, with no other motive than the love of approbation and apparently without the intellectual perception of any relation between the things.

After a while, instead of the individual labels, letters were given to her on detached pieces of paper: they were arranged side by side, so as to spell *b o o k*, *k e y*, etc., then they were mixed up in a heap, and a sign was made for her to arrange them so as to express the words *book*, *key*, etc., and she did so.

Hitherto, the process had been mechanical, and the success about as great as teaching a very knowing dog a variety of tricks. The poor child had sat in mute amazement, and patiently imitated every thing her teacher did. But now the truth began to flash upon her; her intellect began to work; she perceived that here was a way by which she could herself make up a sign of anything that was in her own mind, and show it to another mind; and at once her countenance lighted up with a human expression: it was no longer a dog or parrot,—it was an immortal spirit, eagerly seizing upon a new link of union with other spirits! Dr. Howe could almost fix upon the moment when this truth dawned upon her mind, and spread its light to her countenance. He saw that the great obstacle was overcome, and that henceforward nothing but patient and persevering, though plain and straightforward, efforts were to be used.

The result, thus far, is quickly related and easily conceived; but not so was the process, for many weeks of apparently unprofitable labour were passed before it was effected.

When it was said above that a sign was made, the meaning was, that the action was performed by her teacher—the feeling his hands, and then imitating the motion.

The next step was to procure a set of metal types, with the different letters of the alphabet cast upon their ends; also a board, in which were square holes, into which she could set the types, so that only the letters on their ends could be felt above the surface.

Then, on any article being handed to her—for instance, a pencil or a watch—she would select the component letters, and arrange them on her board, and read them with apparent pleasure.

She was exercised for several weeks in this way, until her vocabulary became extensive; and then the important step was taken of teaching her how to represent the different letters by the position of her fingers, instead of the cumbrous apparatus of the board and types. She accomplished this speedily and easily, for her intellect had begun to work in aid of her teacher, and her progress was rapid.

This was the period, about three months after she had commenced, that the first report of her case was made, in which it is stated, that "she has just learnt the manual alphabet as used by the deaf mutes, and it is a subject of delight and wonder to see how rapidly, correctly, and eagerly she goes on with her labours. Her teacher gives her a new object—for

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instance, a pencil—first lets her examine it, and get an idea of its use, then teaches her how to spell it by making the signs for the letters with her own fingers: the child grasps his hand and feels his fingers, as the different letters are formed; she turns her head a little on one side, like a person listening closely; her lips are apart, she seems scarcely to breathe; and her countenance, at first anxious, gradually changes to a smile as she comprehends the lesson. She then holds up her tiny fingers, and spells the word in the manual alphabet; next, she takes her types and arranges her letters; and at last, to make sure she is right, she takes the whole of the types composing the word, and places them upon or in contact with the pencil, or whatever the object may be."

The whole of the succeeding year was passed in gratifying her eager inquiries for the names of every object which she could possibly handle; in exercising her in the use of the manual alphabet; in extending, by every possible way, her knowledge of the physical relations of things, and in taking proper care of her health.

At the end of the year a report of her case was made, from which the following is an extract:—"It has been ascertained, beyond the possibility of doubt, that she cannot see a ray of light, cannot hear the least sound, and never exercises her sense of smell, if she has any. Thus her mind dwells in darkness and stillness as a closed tomb at midnight. Of beautiful sights, and sweet sounds, and pleasant odours she has no conception; nevertheless, she seems as happy and playful as a bird or a lamb; and the employment of her intellectual faculties, or acquirement of a new idea, gives her a vivid pleasure, which is plainly marked in her expressive features. She never seems to repine, but has all the buoyancy and gaiety of childhood. She is fond of fun and frolic, and when playing with the rest of the children, her shrill laugh sounds loudest in the group.

"When left alone, she seems very happy if she has her knitting or sewing, and will busy herself for hours; if she has no occupation, she evidently amuses herself by imaginary dialogues, or by recalling past impressions; she counts with her fingers, or spells out names of things which she has recently learnt in the manual alphabet of the deaf mutes. In this lonely self-communion she seems to reason, reflect, and argue; if she spells a word wrong with the fingers of her right hand, she instantly strikes it with her left, as her teacher does, in sign of disapprobation; if right, then she pats herself upon the head, and looks pleased. She sometimes purposely spells a word wrong with the left hand, looks roguish for a moment, and laughs, and then with the right hand strikes the left, as if to correct it.

"During the year, she has attained great dexterity in the use of the manual alphabet of the deaf mutes; and she spells out the words and sentences which she knows so fast and so deftly, that only those accustomed to this language can follow with the eye the rapid motion of her fingers. But wonderful as is the rapidity with which she writes her thoughts upon the air, still more so is the ease and accuracy with which she reads the words thus written by another, grasping his hand in hers, and following every movement of his fingers, as letter after letter conveys its meaning to her mind. It is in this way that she converses with her blind playmates; and nothing can more forcibly show the power of mind in forcing matter to its purpose than a meeting between them. For if great talent and skill are necessary for two pantomimes to paint their thoughts and feelings by the movements of the body and the expression of the countenance, how much greater the difficulty when darkness shrouds them both, and the one can hear no sound! When Laura is walking through a passage-way, with her hands spread before her, she knows instantly those whom she meets, and passes them with a sign of recognition; but if it be a girl of her own age, and especially if one of her favourites, there is instantly a bright smile of recognition—a twining of arms, a grasping of hands, and a swift telegraphing upon the tiny fingers, whose rapid evolutions convey the thoughts and feelings from the outposts of one mind to those of the other. There are questions and answers, exchanges of joy or sorrow; there are kisses and caresses, just as between little children with all their senses."

During this year, and six months after she had left home, her mother came to visit her; and the scene of their meeting was an interesting one.

The mother stood some time gazing, with overflowing eyes, upon her unfortunate child, who, all unconscious of her presence, was playing about the room. Presently Laura ran against her, and at once began feeling her hands, examining her dress, and trying to find out if she knew it; but not succeeding in this, she turned away as from a stranger, and the poor woman could not conceal the pang she felt at finding that her beloved child did not know her. She then gave Laura a string of beads which she used to wear at home, which were recognised by the child at once, who with much joy put them around her neck, and sought Dr. Howe eagerly, to say she understood the string was from her home.

The mother now tried to caress her child, but poor Laura repelled her, preferring to be with her acquaintances. Another article from home was now given her, and she began to look much interested; she examined the stranger more closely, and gave Dr. Howe to understand that she knew she came from Hanover; she even endured her caresses, but would leave her with indifference at the slightest signal. The distress of the mother was now painful to behold; for, although she had feared that she should not be recognised, the painful reality of being treated with cold indifference by a darling child was too much for woman's nature to bear.

After a while, on the mother's taking hold of her again, a vague idea seemed to flit across Laura's mind, that this could not be a stranger; she therefore very eagerly felt her hands, while her countenance assumed an expression of intense interest, she became very pale, and then suddenly red; hope seemed struggling with doubt and anxiety, and never were contending emotions more strongly depicted upon the human face. At this moment of painful uncertainty the mother drew her closer to her side, and kissed her fondly, when at once the truth flashed upon the child, and all mistrust and anxiety disappeared from her face, as with an expression of exceeding joy she eagerly nestled to the bosom of her parent, and yielded herself to her fond embraces. After this, the beads were all unheeded; the playthings which were offered to her were utterly disregarded; her playmates, for whom but a moment before she gladly left the stranger, now vainly strove to pull her from her mother; and though she yielded her usual instantaneous obedience to Dr. Howe's signal to follow him, it was evidently with painful reluctance. She clung close to him, as if bewildered and fearful; and when, after a moment, he took her to her mother, she sprang to her arms, and clung to her with eager joy.

Dr. Howe had watched the whole scene with intense interest, being desirous of learning from it all he could of the workings of her mind; but he now left them to indulge unobserved those delicious feelings which those who have known a mother's love may conceive, but which cannot be expressed.

The subsequent parting between Laura and her mother showed the affection, the intelligence, and the resolution of the child, and was thus noticed at the time: "Laura accompanied her mother to the door, clinging close to her all the way, until they arrived at the threshold, where she paused and felt around, to ascertain who was near her. Perceiving the matron, of whom she is very fond, she grasped her with one hand, holding on convulsively to her mother with the other, and thus she stood for a moment; then she dropped her mother's hand, put her handkerchief to her eyes, and turning round, clung sobbing to the matron, while her mother departed with emotions as deep as those of her child."

* * * * *

(1841.) It was remarkable that she could distinguish different degrees of intellect in others, and that she soon regarded a newcomer almost, with contempt when after a few days she discovered her weakness of mind. This unamiable part of her character has been more strongly developed during the past year.

She chooses for her friends and companions those children who are intelligent and can talk best with her; and she evidently dislikes to be with those who are deficient in intellect, unless, indeed, she can make them serve her purposes, which she is evidently inclined to do. She takes advantage of them and makes them wait upon her in a manner that she

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knows she could not exact of others, and in various ways she shows her Anglo-Saxon blood.

She is fond of having other children noticed and caressed by the teachers and those whom she respects, but this must not be carried on too far, or she becomes jealous. She wants to have her share, which, if not the lion's, is the greater part, and if she does not get it, she says, "*My mother will love me.*"

Her tendency to imitation is so strong that it leads her to actions which must be entirely incomprehensible to her, and which can give her no other pleasure than the gratification of an internal faculty. She has been known to sit for half an hour, holding a book before her sightless eyes, and moving her lips as she has observed seeing people do when reading.

She one day pretended that her doll was sick, and went through all the motions of tending it and giving it medicine; she then put it carefully to bed, and placed a bottle of hot water to its feet, laughing all the time most heartily. When Dr. Howe came home, she insisted upon his going to see it and feel its pulse; and when he told her to put a blister to its back, she seemed to enjoy it amazingly, and almost screamed with delight.

Her social feelings and her affections are very strong; and when she is sitting at work, or at her studies, by the side of one of her little friends, she will break off from her own task every few minutes to hug and kiss her, with an earnestness and warmth which is touching to behold.

When left alone, she occupies, and apparently amuses herself, and seems quite contented; and so strong seems to be the natural tendency of thought to put on the garb of language, that she often soliloquizes in the *finger language*, slow and tedious as it is. But it is only when alone that she is quiet; for if she becomes sensible of the presence of any persons near her, she is restless until she can sit close beside them, hold their hand, and converse with them by signs.

She does not cry from vexation and disappointment, like other children, but only from grief. If she receives a blow by accident, or hurts herself, she laughs and jumps about, as if trying to drown the pain by muscular action. If the pain is severe, she does not go to her teachers or companions for sympathy, but on the contrary tries to get away by herself, and then seems to give vent to a feeling of spite, by throwing herself about violently, and roughly handling whatever she gets hold of.

Twice only have tears been drawn from her by the severity of pain, and then she ran away from the room, as if ashamed of crying for an accidental injury. But the fountain of her tears is by no means dried up, as is seen when her companions are in pain, or her teacher is grieved.

In her intellectual character, it is pleasing to observe an insatiable thirst for knowledge, and a quick perception of the relations of things. In her moral character, it is beautiful to behold her continual gladness—her keen enjoyment of existence—her expansive love—her unhesitating confidence—her sympathy with suffering—her conscientiousness, truthfulness, and hopefulness.

She is remarkably correct in her deportment, and few children of her age evince so much sense of propriety in regard to appearance. Never, by any possibility, is she seen out of her room with her dress disordered; and if by chance any spot of dirt is pointed out to her on her person, or any little rent in her dress, she discovers a sense of shame, and hastens to remove or repair it.

She is never discovered in an attitude or an action at which the most fastidious would revolt; but is remarkable for neatness, order, and propriety.

There is one fact which is hard to explain in any way, viz. the difference of her deportment to persons of different sex. This was observable when she was only seven years old. She is very affectionate; and when with friends of her own sex, she is constantly clinging to them, and often kissing and caressing them; and when she meets with strange ladies, she very soon becomes familiar, examines very freely their dress, and readily allows them to caress her. But with those of the other sex it is entirely different, and she repels every approach to familiarity.

Laura has often amused herself during the past year (1846) by little exercises in composition. The following story, written during the absence of her teacher, will serve as a specimen of her use of language. The last sentence, though not grammatical, may be considered as the moral, and a very good moral, of the whole:—

"THE GOOD-NATURED GIRL.

"Lucy was nearly nine years old. She had excellent parents. She always did with alacrity what her mother requested her to do. She told Lucy when it was time for her to go to school; so Lucy ran and put on her bonnet and shawl and then went back to her mamma. She offered Lucy a basket containing some pie and cake for luncheon. And Lucy went precisely at schooltime, and when she got to the house she took her own seat and began to study diligently with all the children. And she always conformed to her teacher's wishes—In recess she took luncheon out of her basket, but she gave some of it to her mates—Lucy had some books with pictures and slate in her desk—

"When she went home she found that dinner was all ready—Afterwards her mother took her to take tea with her friends. Lucy was much delighted to play with her little cousin Lucy and Helen; and they let her see their playthings. After tea Lucy was sorry to depart; and when she went to bed she thought that she had made it pleasantly to all her friends with little joyful heart."

Laura keeps a sort of diary, in which she writes with her own hand an account of what passes every day. It is generally a bald narration of the facts; but an extract will give an idea of her daily routine of study. The diary is generally very legibly written. We will transcribe a day's record, exactly as she wrote it, with her spelling and punctuation, putting any explanations that may be necessary in brackets. The only alteration is in the use of capitals, which she has never been taught to make.

"SIXTH OF JAN TUESDAY.

"I studied arithmetic before my breakfast. Afterwards Miss Wight was occupied for Dr. till quarter to ten. Then she read to me about Bible. Abraham went to live in the city Gerar. He and his wife lived in the western corner of Palestine place [country]. But his son Isaac was very kind to comfort his parents when they grew old [.] Isaac was always good to take care of them and made them feel very happy. Abraham thanked God for his kindness exceedingly.

"Wight taught me two more lessons geography and history. Putnam was a farmer who was ploughing his land with the cattle in a field. When tidings were brought to him of a battle at Lexington he did not stop to unhartness the cattle but ran very rapidly to his home and went to live in Boston. In a few weeks thirty thousand of soldiers arrived to Boston. Most of them had no cannons nor leads nor guns. And the British went to Bunker Hill from Boston to attack the Americans and expel them away when they were going to fire upon them. And when the British saw them ready they were surprised."

Her store of knowledge has been very much increased during the last year. It will be seen, too, that she has improved in the use of language; and when it is considered that other deaf mutes have as great advantage over her as we have over them, if not greater, her style will bear comparison with theirs.

She has become somewhat more thoughtful and sedate than formerly, though she is generally very cheerful, and sometimes displays a childish humour that shows her age is to be measured by the degrees of her mental development, rather than by the number of years that she has lived.

She has extended the circle of her acquaintance, and has endeared herself to many persons who have learnt to converse with her. It is the earnest hope of all that her life may be prolonged, and that we may be enabled to do our duty to her and to ourselves by making it as happy and useful as possible.

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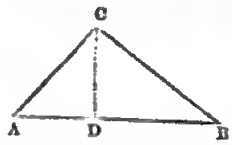
(1850). Her progress has been a curious and an interesting spectacle. She has come into human society with a sort of triumphal march; her course has been a perpetual ovation

Thousands have been watching her with eager eyes, and applauding each successful step, while she, all unconscious of their gaze, holding on to the slender thread, and feeling her way along, has advanced with faith and courage towards those who awaited her with trembling hope. Nothing shows more than her case the importance which, despite their useless waste of human life and human capacity, men really attach to a human soul. They owe to her something for furnishing an opportunity of showing how much goodness there is in them; for surely the way in which she has been regarded is creditable to humanity.

LESSONS IN TRIGONOMETRY.—No. II.

SOLUTIONS OF OBLIQUE-ANGLED TRIANGLES.

THEOREM I. *In any plane triangle, the sines of the angles are proportional to the opposite sides.*



Let ABC be any triangle, and from one of its angles, as C, let CD be drawn perpendicular to AB. Then, because the triangle ACD is right-angled at D, we have,

B : sin. A :: AC : CD; whence B × CD = sin. A × AC.

For the same reason,

B : sin. B :: BC : CD; whence B × CD = sin. B × BC.

Therefore, sin. A × AC = sin. B × BC;

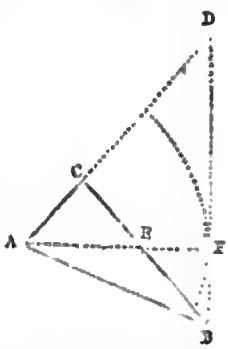
or, sin. A : sin. B :: BC : AC.

THEOREM II. *In any plane triangle, the sum of any two sides is to their difference as the tangent of half the sum of the opposite angles is to the tangent of half their difference.*

Let ABC be any triangle; then will

$$CB + CA : CB - CA :: \text{tang.}\ \frac{A+B}{2} : \text{tang.}\ \frac{A-B}{2}.$$

Produce AC to D, making CD equal to CB, and join DB. Take CE equal to CA, draw AE, and produce it to F. Then AD is the *sum* of CB and CA, and EB is their *difference*.



The sum of the two angles CAE, CEA, is equal to the sum of CAB, CBA, each being the supplement of ACB. But since CA is equal to CE, the angle CAE is equal to the angle CEA; therefore, CAE is the *half sum* of the angles CAB, CBA. Also, if from the greater of the two angles CAB, CBA, there be taken their half sum, the remainder, FAB, will be their *half difference*.

Since CD is equal to CB, the angle ADF is equal to the angle EBF; also, the angle CAE is equal to AEC, which is equal to the vertical angle BEF. Therefore, the two triangles DAF, BEF, are mutually equiangular; hence, the two angles at F are equal, and AF is perpendicular to DB. If, then, AF be made radius, DF will be the tangent of DAF, and BF will be the tangent of BAF. But, by similar triangles, we have,

AD : BE :: DF : BF; that is,

$$CB + CA : CB - CA :: \text{tang.}\ \frac{A+B}{2} : \text{tang.}\ \frac{A-B}{2}.$$

THEOREM III. *If from any angle of a triangle a perpendicular be drawn to the opposite side or base, the whole base will be to the sum of the other two sides as the difference of those two sides is to the difference of the segments of the base.*

In every plane triangle, three parts must be given to enable us to determine the others; and of the given parts, one, at least, must be a side. In solving oblique-angled triangles, four different cases may therefore be presented. There may be given,

1. Two angles and a side;
2. Two sides and an angle opposite one of them;
3. Two sides and the included angle; or,
4. The three sides.

We shall represent the three angles of the proposed triangle by A B C, and the sides opposite them, respectively, by a b c.

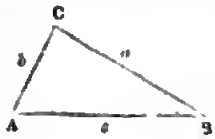
CASE I. *Given two angles and a side, to find the third angle and the other two sides.*

To find the third angle, add the given angles together, and subtract their sum from 180°.

The required sides may be found by Theorem I. The proportion will be,

The sine of the angle opposite the given side : the given side :: the sine of the angle opposite the required side : the required side.

Ex. 1. In the triangle A B C, there are given the angle A, 57° 15′, the angle B, 35° 30′, and the side c, 364, to find the other parts.



The sum of the given angles, subtracted from 180°, leaves 87° 15′ for the angle C. Then, to find the side *a*, we say,

sin. C : c :: sin. A : a.

By natural numbers,

·998848 : 364 :: ·841039 : 306·49 = a.

This proportion is most easily worked by logarithms, thus:

As the sine of the angle C, 87° 15′, comp.	0·000500
Is to the side *c*, 364	2·561101
So is the sine of the angle A, 57° 15′	9·924816
To the side *a*, 306·49	2·486417

To find the side *b*:

sin. C : c :: sin B : b.

By natural numbers,

·998848 : 364 :: ·580703 : 211·62 = b.

The work by logarithms is as follows:

sin. C, 87° 15′, comp.	0·000500
: *c*, 364	2·561101
:: sin. B, 35° 30′	9·763954
: *b*, 211·62	2·325555.

Ex. 2. In the triangle A B C, there are given the angle A, 49° 25′, the angle C, 63° 48′, and the side *c*, 275, to find the other parts.

Ans. B = 66° 47′; a = 232·766; b = 281·67.

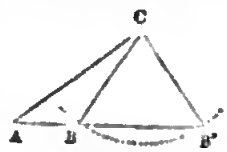
CASE II. *Given two sides and an opposite angle, to find the third side and the remaining angles.*

One of the required angles is found by Theorem I. The proportion is,

The side opposite the given angle : the sine of that angle :: the other given side : the sine of the opposite angle.

The third angle is found by subtracting the sum of the other two from 180°, and the third side is found as in Case I.

If the side B C, opposite the given angle A, is shorter than the other given side A C, the solution will be *ambiguous;* that is, two different triangles, A B C, A B′ C, may be formed, each of which will satisfy the conditions of the problem.



The numerical result is also ambiguous, for the fourth term of the first proportion is a sine of an angle. But this may be the sine either of the *acute* angle A B′ C, or of its supplement,

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the obtuse angle A B C. In practice, however, there will generally be some circumstance to determine whether the required angle is acute or obtuse. If the given angle is obtuse, there can be no ambiguity in the solution, for then the remaining angles must of course be acute.

Ex. 1. In a triangle A B C, there are given A C, 458, B C, 307, and the angle A, 28° 45′, to find the other parts.

To find the angle B:

B C : sin. A : : A C : sin. B.

By natural numbers,

307 : ·480989 : : 458 : ·717568, sin. B, the arc corresponding to which is 45° 51′ 14″, or 134° 8′ 46″.

This proportion is most easily worked by logarithms, thus:

B C, 307, comp.	7·512862
: sin. A, 28° 45′	9·682135
: : A C, 458	2·660865
: sin. B, 45° 51′ 14″, or 134° 8′ 46″	9·855862.

The angle A B C is 134° 8′ 46″, and the angle A B′ C, 45° 51′ 14″. Hence, the angle A C B is 17° 6′ 14″, and the angle A C B′, 105° 23′ 46″.

To find the side A B:

sin. A : C B : : sin. A C B : A B.

By logarithms,

sin. A, 28° 45′, comp.	0·317865
: C B, 307	2·487138
: : sin. A C B, 17° 6′ 14″	9·468502
: A B, 187·72	2·273505.

To find the side A B′:

sin. A : C B′ : : sin. A C B′ : A B′.

By logarithms,

sin. A, 28° 45′, comp.	0·317865
: C B′, 307	2·487138
: : sin. A C B′, 105° 23′ 46″	9·984128
: A B′, 615·36	2·789131.

Ex. 2. In a triangle A B C, there are given A B, 532, B C, 658, and the angle C, 107° 40′, to find the other parts.

Ans. A = 39° 52′ 52″; B = 32° 27′ 8″; A C = 290·6.

In this example there is no ambiguity, because the given angle is obtuse.

Case III. *Given two sides and the included angle, to find the third side and the remaining angles.*

The *sum* of the required angles is found by subtracting the given angle from 180°. The *difference* of the required angles is then found by Theorem II. Half the difference added to half the sum gives the greater angle, and subtracted, gives the less angle. The third side is then found by Theorem I.

Ex. 1. In the triangle A B C, the angle A is given 53° 8′; the side *c*, 420, and the side *b*, 535, to find the remaining parts.

The sum of the angles B + C = 180° − 53° 8′ = 126° 52′.

Then, by Theorem II.,

535 + 420 : 535 − 420 : : tang. 63° 26′ : tang. 13° 32′ 24″.

Hence, the angle B is 76° 58′ 24″, and the angle C, 49° 53′ 36″.

To find the side *a*:

sin. C : *c* : : sin. A : *a* = 439·32.

Ex. 2. Given the side *c*, 176, *a*, 133, and the included angle B, 73°, to find the remaining parts.

Ans. *b* = 187·022, the angle C, 64° 9′ 3″, and A, 42° 50′ 57″.

Case IV. *Given the three sides, to find the angles.*

Let fall a perpendicular upon the longest side from the opposite angle, dividing the given triangle into two right-angled triangles. The two segments of the base may be found by Theorem III. There will then be given the hypothenuse and one side of a right-angled triangle to find the angles.

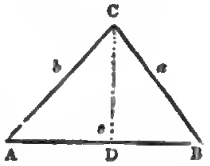
Ex. 1. In the triangle A B C, the side *a* is 261, the side *b*, 346, and *c*, 395. What are the angles?

Let fall the perpendicular C D upon A B.

Then, by Theorem III.,

A B : A C + C B : : A C − C B : A D − D B;

or, 395 : 608 : : 84 : 128·87.



Therefore, A D is 261·935, and B D, 133·065.

Then, in each of the right-angled triangles, A C D, B C D, we have given the hypothenuse and base. Hence,

A C : R : : A D : cos. A = 40° 36′ 13″
B C : R : : B D : cos. B = 69° 20′ 52″.

Therefore the angle C = 80° 2′ 55″.

Ex. 2. If the three sides of a triangle are 150, 140 and 130, what are the angles?

Ans. 87° 22′ 48″, 59° 29′ 23″, and 53° 7′ 49″

Examples for Practice.

1. Given two sides of a triangle, 478 and 567, and the included angle, 47° 30′, to find the remaining parts.

2. Given the angle A, 55° 34′, the opposite side *a*, 735, and the side *b*, 576, to find the remaining parts.

3. Given the angle A, 65° 40′, the angle B, 74° 20′, and the side *a*, 276, to find the remaining parts.

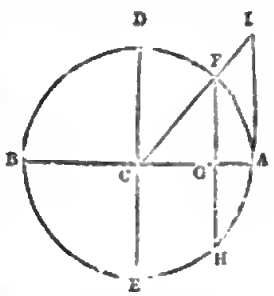
4. Given the three sides, 742, 657 and 379, to find the angles.

5. Given the angle A, 116° 32′, the opposite side *a*, 492, and the side *c*, 295, to find the remaining parts.

6. Given the angle C, 56° 18′, the opposite side *c*, 131, and the side *b*, 219, to find the remaining parts.

Values of the Sines, Cosines, etc., of certain Angles.

We propose now to examine the changes which the sines, cosines, etc., undergo in the different quadrants of a circle. Draw two diameters, A B, D E, perpendicular to each other. The angle A C D is called the *first* quadrant, the angle D C B the *second* quadrant, the angle B C E the *third* quadrant, and the angle E C A the *fourth* quadrant.



Suppose one extremity of the arc remains fixed in A, while the other extremity, marked F, runs round the entire circumference in the direction A D E B.

When the point F is at A, or when the arc A F is zero, the sine is zero. As the point F advances toward D, the sine increases; and when the arc A F becomes 45°, the triangle C F O being isosceles, we have F O : C F : : 1 : $\sqrt{2}$;

or, sin. 45° : R : : 1 : $\sqrt{2}$.

Hence, $\sin. 45° = \frac{R}{\sqrt{2}} = \frac{1}{2} R \sqrt{2}$.

The sine of 30° is equal to half radius. Also, since $\sin. A = \sqrt{R^2 - \cos.^2 A}$, the sine of 60°, which is equal to the cosine of 30°, $= \sqrt{R^2 - \frac{1}{4}R^2} = \sqrt{\frac{3}{4}R^2} = \frac{1}{2} R \sqrt{3}$.

The arc A F continuing to increase, the sine also increases till F arrives at D, at which point the sine is equal to the radius; that is, the sine of 90° = R.

As the point F advances from D toward B, the sines diminish, and become zero at B; that is the sine of 180° = 0.

In the third quadrant, the sine increases again, becomes equal to radius at E, and is reduced to zero at A.

When the point F is at A, the cosine is equal to radius. As the point F advances toward D, the cosine decreases, and the

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cosine of 45° = sine 45° = ½a $\sqrt{2}$. The arc continuing to increase, the cosine diminishes till P arrives at D, at which point the cosine becomes equal to zero. The cosine in the second quadrant increases, and becomes equal to radius at B; in the third quadrant it decreases, and becomes zero at E; in the fourth quadrant it increases again, and becomes equal to radius at A.

The tangent begins with zero at A, increases with the arc, and at 45° becomes equal to radius. As the point P approaches D, the tangent increases very rapidly; and when the difference between the arc and 90° is less than any assignable quantity, the tangent is greater than any assignable quantity. Hence, the tangent of 90° is said to be infinite.

In the second quadrant, the tangent is at first infinitely great, and rapidly diminishes, till at B it is reduced to zero. In the third quadrant it increases again, becomes infinite at E, and is reduced to zero at A.

The cotangent is equal to zero at B and E, and is infinite at A and E.

The secant begins with radius at A, increases through the first quadrant, and becomes infinite at D; diminishes in the second quadrant, till at B it is equal to the radius; increases again in the third quadrant, and becomes infinite at E; decreases in the fourth quadrant, and becomes equal to the radius at A.

The cosecant is equal to radius at D and E, and is infinite at A and B.

Let us now consider the algebraic signs by which these lines are to be distinguished. In the first and second quadrants, the sines fall *above* the diameter A B, while in the third and fourth quadrants they fall *below*. This opposition of directions ought to be distinguished by the algebraic signs; and if one of these directions is regarded as positive, the other ought to be considered as negative. It is generally agreed to consider those sines which fall *above* the horizontal diameter as positive; consequently, those which fall *below* must be regarded as negative. That is, the sines are positive in the first and second quadrants, and negative in the third and fourth.

In the first quadrant the cosine falls on the *right* of D E, but in the second quadrant it falls on the *left*. These two lines should obviously have opposite sides, and it is generally agreed to consider those which fall to the right of the vertical diameter as positive; consequently, those which fall to the left must be considered negative. That is, the cosines are positive in the first and fourth quadrants, and negative in the second and third.

The signs of the tangents are derived from those of the sines and cosines. For tang. $= \frac{\text{R. sin.}}{\text{cos.}}$. Hence, when the sine and cosine have like algebraic signs, the tangent will be positive; when unlike, negative. That is, the tangent is positive in the first and third quadrants, and negative in the second and fourth.

Also, cotangent $= \frac{\text{R. cos.}}{\text{sin.}}$; hence, the tangent and cotangent have the same sign.

We have seen that sec. $= \frac{\text{R}^2}{\text{cos.}}$; hence, the secant must have the same sign as the cosine.

Also, cosec. $= \frac{\text{R}^2}{\text{sin.}}$; hence, the cosecant must have the same sign as the sine.

The preceding results are exhibited in the following tables, which should be made perfectly familiar:—

	1st quad.	2nd quad.	3rd quad.	4th quad.
Sine and cosecant	+	+	−	−
Cosine and secant	+	−	−	+
Tangent and cotangent	+	−	+	−

	0°	90°	180°	270°	360°
Sine	0	+ R	0	− R	0
Cosine	+ R	0	− R	0	+ R
Tangent	0	∞	0	∞	0
Cotangent	∞	0	∞	0	∞
Secant	+ R	∞	− R	∞	+ R
Cosecant	∞	+ R	∞	− R	∞

In astronomy, we frequently have occasion to consider arcs greater than 360°. But if an entire circumference, or any number of circumferences, be added to any arc, it will terminate in the same point as before. Hence, if c represent an entire circumference, or 360°, and A any arc whatever, we shall have,

sin. A = sin. (c + A) = sin. (2 c + A) = sin. (3 c + A) =, etc.

The same is true of the cosine, tangent, etc.

We generally consider those arcs as positive which are estimated from A in the direction A D B. If, then, an arc were estimated in the direction A E D, it should be considered as negative; that is, if the arc A F be considered positive, A H must be considered negative. But the latter belongs to the fourth quadrant; hence its sine is negative. Therefore, sin. (− A) = − sin. A.

The cosine C O is the same for both the arcs A F and A H.

Hence, cos. (− A) = cos. A.
Also, tang. (− A) = − tang. A.
And cot. (− A) = − cot. A.

LESSONS IN ITALIAN GRAMMAR.—No. XLIX.

SYNTAX.

The Italian Syntax is the art of uniting together the words and phrases of an Italian sentence.

OF ARTICLES.

THE DEFINITE ARTICLE.

Rule 1.—The Definite Article *il, lo, la,* the, must agree with nouns in gender and number.

Examples.

Seguite il sentiere, follow the path
Passate il ruscello, cross the brook
Lo studio è piacevole, study is pleasant
La zuppa era fredda, the soup was cold
Porta i tondi, he carries the plates

Rule 2.—The definite article *il, lo, la,* the, is used before substantives taken in a *general sense.*

Examples.

Gli Inglese sono generosi, the English are generous
Gli uomini sono mortali, men are mortal
La giustizia è assai rara, justice is very rare
L'industria ci arricchisce, industry enriches us
Il nero e il rosso son più stimati del giallo e del grigio, black and red are more esteemed than yellow and grey

Rule 3.—The definite article *il, lo, la,* the, is used before substantives taken in a *particular sense.*

Examples.

La carità è nel cuore delle donne, charity is in the heart of woman
Sento le campane della chiesa, I hear the bells of the church
Ho smarrita la chiave dell' uscio, I have mislaid the key of the door
I piaceri sono I fiori della vita, pleasures are the flowers of life
Sono state in tutte le città dell' Italia, I have been in all the cities of Italy

Rule 4.—The definite article *il, lo, la,* the, is generally used before names of countries, kingdoms, mountains, provinces, rivers, seasons and winds.

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Examples.

Le quattro parti del mondo sono l' Europa, l' Asia, l' Africa, e l' America, the four parts of the world are Europe, Asia, Africa, and America.

E' il Rodano un grandissimo fiume il quale esce di quella medesima montagna, della quale escono il Danubio e 'l Reno, tho Rhone, which springs from the same mountain which produces the Danube and the Rhine, is a very large river

La Francia è più popolata dell' Inghilterra, France is more populous than England

L' eruzioni del Vesuvio hanno più volte coperto di sue ceneri le contrade vicine, the eruptions of Vesuvius have several times covered the neighbouring places with its cinders

Il norte, il sud, l'oriente, e l' occidente, sono i venti principali, north, south, east, and west are the principal winds

Rule 5.—The definite article *il, lo, la*, the, is used before the names of dignities, offices, professions, and qualities, and also before signore, signora, and signorina.

Examples.

Il generale Buonaparte, General Buonaparte

Il maresciallo Soult, Marshal Soult

La regina Carlotta, Queen Charlotte

Il signor Pietro è perduto, Master Peter is lost

Parlo della signora Francesca, I speak of Mistress Frances.

Rule 6.—The definite article *il, lo*, the, is used before infinitives and adverbs, taken substantively.

Examples.

Il ballare mi secca, dancing tires me

Il leggere è utile, reading is useful

Non mi ricordo nè il dove, nè il quando, nè il come, I recollect neither where, nor when, nor how

Sto tra 'l sì e 'l no, I am in an uncertainty

Dite il perchè, say the why.

Rule 7.—The definite article *il, lo, la*, the, is suppressed before nouns taken in a general, proverbial, or usual sense.

Examples.

Audacia, fortuna, e virtù gli dettero trono e portenza, audacity, good luck, and merit gave him the sceptre and power

Consiglio, e ragione condussero la vittoria, counsel and reason led the victory

Necessità non ha legge, necessity has no law

Io non ho tempo, I have not time

Andate a casa, go home

Rule 8.—The definite article *il, lo, la*, the, is suppressed before the number of a chapter, or of a page, and before the title of any literary performance.

Examples.

Libro quarto, capitolo quinto, parte prima, book the fourth, chapter the fifth, part the first

Storia d' Italia scritta da Carlo Botta, History of Italy, written by Charles Botta

Arte d' amare da Ovidio, the Art of Loving, by Ovid

Lettere sull' Indie Orientali, Letters on the East Indies

Discorso sopra la lingua Italiana, Discourse on the Italian Tongue

Rule 9.—The definite article *il*, the, is suppressed before numbers denoting the succession of sovereigns.

Examples.

Ho letto il secolo di Luigi decimoquarto, I have read the age of Louis XIV.

Guglielmo terzo fu un gran conquistatore, William the Third was a great conquerer

Carlo decimo non è re di Francia, Charles the Tenth is not king of France

Ho veduto Frederico secondo, I saw Frederick the Second

Enrico quarto fu un buon principe, Henry the Fourth was a good prince

* The titles of *Monsignore, Madama*, and *Madamigella*, take no article; as, *Monsignore* arcivescovo, etc.

THE INDEFINITE ARTICLE.

Rule 10.—The Indefinite Article *uno, una, un*, a or an, must agree with nouns in gender.

Examples.

Troverete un villaggio, you will find a village

Una vespa m' ha punto, a wasp has stung me

Tuo nepote è uno sciocchetello, your nephew is a heedless boy

Portate una sedia, bring a chair

Avremo una state molto calda, we shall have a very hot summer

Rule 11.—The indefinite article *uno, una, un*, a or an, is repeated before every Italian noun.

Examples.

Ho veduto un' uomo, una donna, e un bambino, I have seen a man, woman, and a child

Aveva la signoria di una città e d' un popolo, he had the principality of a city and the people

Datemi un fiasco, ed un bicchiere, give me a bottle and glass

Mettete un tovagliolo, ed una bottiglio sopra la tavola, put on the table a napkin and a bottle

Ho comprato una tavola, ed uno specchio, I have bought a table and a looking-glass

THE PARTITIVE ARTICLE.

Rule 12.—The Partitive Article *di, del, dello, della*, some, is used to express a portion or a part of any thing.

Examples.

Datemi del pane, give me some bread

Comprate delle pernici, buy some partridges

Portategli dell' arrosto, bring to him some roast meat

Prendete della cioccolata, take some chocolate

Ecco della salsa, here is some sauce.

Rule 13.—The Italians use no partitive article when they express the quality or species of a noun taken in a general sense.

Examples.

Bevete vin nero o vin bianco? do you drink red or white wine?

Sono donne leggiadre, these are pretty women

Buono pane, e buon' acqua bastano per la nutrizione del corpo umano, good bread and water are sufficient for the food of the human body

Mangiano come lupi, they eat like wolves

Grandi avvenimenti, e grandi revoluzioni seguirono la morte di Cesare, great events and revolutions followed the death of Cæsar

LESSONS IN SPANISH.—No. XIX.

USE OF THE MOODS AND TENSES OF VERBS.

OF THE INFINITIVE, GERUND, AND PARTICIPLE.

THE present tense of the infinitive expresses affirmation in an indefinite manner, without reference to number or person; as, *decir*, to say; *dar*, to give.

The infinitive is used in Spanish when in English the present participle, preceded by a preposition, is used; as,

Vengo de comer, I come from dining (to-dine) *i.e.* from dinner.

En derramar torrentes de sangre in spilling (to-spill) torrents of blood.

Trabaja sin cesar, he labours without ceasing (to-cease).

The infinitive is frequently used as a verbal noun or present participle, by placing the masculine definite article before it; as,

El murmurar de las fuentes, the murmuring (the to-murmur) of the fountains.
Al caer del dia, at the fall (at the to-fall) of the day:
El leer me gusta, reading (the to-read) pleases me.

The infinitive is often rendered in English by the present participle, when in Spanish it is governed by another verb; as,

La oimos cantar, we heard her singing (to-sing).
Le af *correr*, I saw him run, or running (to-run).

In Spanish, the gerund is employed in the sense of the present participle in English; as,

Estando enfermo el presidente, the president being sick.
Habiendo conspirado unos caballeros, some cavaliers having conspired.
Queriendo seguir dispensándolos, *plantó árboles frutales*, desiring to continue dispensing them, he planted fruitful trees.
Maria está hablando, Mary is speaking.

In sentences such as, charity is increased by cultivating it, it is allowed in Spanish to use either the gerund without the preposition, or the infinitive mood preceded by the preposition *con*; as,

Nuestros deberes se hacen agradables cumpliéndolos; or, *Nuestros deberes se hacen agradables con cumplirlos*, our duties are rendered agreeable by performing them.

Instead of the gerund of the past, the gerund of the present is sometimes employed, preceded by the preposition *en*; as,

En oyendo esto, salió para Bóston; or, *Habiendo oido esto, salió para Bóston*, on hearing this, he set out for Boston; having heard this, he set out for Boston.

The gerund in Spanish is often employed in a manner that requires the adverb "while" to be used in translating it into English; as,

El que vive en deleites, viviendo está muerte, he who lives in pleasures, while living is dead.

The past participle is indeclinable when used to form the compound tenses with the auxiliary verb *haber*; as,

Ella ha hablado, she has spoken.
Las mugeres han hablado, the women have spoken.

When the past participle is used with any other verb than *haber*, it is declinable; as,

Ella ha sido seducida, she has been deceived.
Mis caballos estan lastimados, my horses are injured.
Mis hijas se hallan molestadas, my daughters find themselves molested.
Mis hermanas quedan satisfechas, my sisters remain satisfied.
Ellas van satisfechas, they go satisfied.
Ella anda pasmada de mis palabras, she walks enraptured with my words.
Tiene escritas tres cartas, he has three letters written.
Lleva escritas tres cartas, he carries written three letters.

These last examples, it will be perceived, require the participle to agree with the noun governed (*cartas*). *Tener* and *llevar* are, as above, sometimes used as a kind of auxiliary verbs, and can always be rendered by have; thus each of these examples may be translated, "he has written three letters."

The past participle is in Spanish used with a noun or pronoun in the case absolute; thus, *hallado* means found, and absolutely, being found; *enviado* means sent, and absolutely, being sent; *recibido* means received and being received. In general the participle is placed before the noun of the case absolute, with which it agrees (though the rules of Spanish construction admit of its being placed after the noun); as,

Tomada Vera-Cruz, el General Scott salió para Jalapa, Vera Cruz being taken, General Scott set out for Jalapa

OF THE TENSES OF THE INDICATIVE MOOD.

The present tense expresses an existing state or an action occurring at the time in which we are speaking; as,

Mi hermano escribe, my brother writes.
Estas doncellas son amadas, these maidens are beloved.

The verb *estar* can be used with the gerund in Spanish, as in English the verb to be with the present participle; as,

Juan está leyendo, John is reading.
Ellos están cantando, they are singing.

The verbs ir (to go) and *venir* (to come) do not admit of the verb *estar* coming before their gerund as in the above rule. Thus we cannot say in Spanish *yo estoy yendo* and *yo estoy viniendo*, but *yo voy* and *yo vengo* (I go and I come), I am going and I am coming.

The imperfect tense is used to express what is past, and, at the same time, present, with regard to something else which is past; that is, it is a past tense which was still present at the time spoken of. It may always be employed in Spanish when in English the word "was" can be used with the present participle, or "used to" can be employed with the verb, or when we speak of habitual actions; as,

Ella escribia entónces, she was writing then.
Seneca razonaba bien, Seneca reasoned well.
Cervántes era un escritor elegante, Cervantes was an elegant writer.
Neron era un tirano, Nero was a tyrant.
Cuando fui niño, hablaba como niño, when I was a child, I spoke as a child.
Ellos marchaban por las calles cuando los vimos, they were marching through the streets when we saw them.

It is evident that "Seneca reasoned well" means Seneca used to reason (or was accustomed to reason) well. So, they walked rapidly while she looked, means, they were walking rapidly while she was looking, and of course, with this meaning, walked and looked would be put in the imperfect tense in Spanish. So, I went to the opera three times a week last summer; *i.e.* I was in the habit of going, etc.

The perfect definite tense shows the action or being affirmed by the verb, to be completed, at a time of which nothing more remains, often specified by an adverb or some other circumstance expressed or understood; as,

Recibió dos cartas la semana pasada, he received two letters last week.
El presidente no le perdonó, the president pardoned him not.
Diego vivia cuando le vi, James was living when I saw him.
Escribió una carta ayer, he wrote a letter yesterday.
Luego que Juan se lo dijo, lloraron, as soon as John told it to them, they wept.

As both the imperfect and perfect definite in Spanish are included in English in what is called the imperfect tense, it is important that the learner should be able to distinguish the use of each in Spanish. When an action or event is entirely past and finished, the perfect definite is used; but when it is meant to say that the action or event was taking place at a certain time, and that it is or may be still continued, the imperfect must be used. Thus, *los soldados marchaban por la ciudad*, means, the soldiers were marching through the city, and so far as the word *marchaban* is concerned, they may be marching still; but *los soldados marcharon por la ciudad* means, the soldiers marched through the city, and from the tense employed are marching no longer.

The perfect indefinite is used to express an action or event, which, though entirely past, has taken place during a period of time (expressed or understood) of which the present forms a part, or at a time designated in an indeterminate manner; as,

He hablado á Rodrigo esta semana, I have spoken to Roderick this week.
Han comido pan hoy, they have eaten bread to-day.
Vmd. ha estado muy enfermo, you have been very sick.

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The past actions of persons or things still in existence, if no particular time be mentioned, are expressed in this tense; as,

El General ha tomado varias ciudades, the general has taken several cities.

The only cases in which the English perfect tense and the Spanish perfect indefinite do not correspond are such as the following: "It has been snowing these three hours;" "he has been in Mexico for these ten years;" which in Spanish would be, *hace tres horas que nieva; hace diez años que estoy en Méjico*, which mean literally, "it-is three hours that (since) it-snows;" "it-is ten years that (since) I-am in Mexico." If the sentence be negative, the perfect indefinite is employed; as, *hace ocho dias que no la hemos visto*, it-is eight days that we-have not seen her, that is, "we have not seen her for eight days." If the action or event be completed, the perfect definite must be used; as, *hace diez años que el rey lo perdonó*, it-is ten years that (since) the king pardoned him.

Hay (or *ha*) is sometimes used instead of *hace* in cases like the examples in the last paragraph; as, *hay pocos dias que entré en el cuarto de mi amigo*, it has few days that (since) I-entered into the room of my friend, that is, "a few days ago, I-entered my friend's room." *Hay* is used at the beginning and *ha* at the end of a phrase; as, *hay pocos dias*, or, *pocos dias ha*.

In some instances we may, both in Spanish and English, use either the perfect indefinite, or if we are sure that the action is completed, the perfect definite; as, *comí pan hoy*, I-ate bread to-day, or *he comido pan hoy*, I have eaten bread to-day.

The first pluperfect is used to express an affirmation of what is past and took place before some other past action or event or time, expressed or understood; as,

Juan ya había comido cuando llegó Ricardo, John already had dined when Richard arrived.

Whenever the former action or event is mentioned as still continuing when the latter occurred, the imperfect tense is employed in Spanish to denote the former; as,

Había tres horas que ella estaba pintando cuando llegó Pedro, it-was three hours that she was painting when Peter arrived.

This last example means in English, she had been painting three hours when Peter arrived; and the use of the imperfect tense shows that she was employed in painting (that is, had not finished) at the time of Peter's arrival.

The second pluperfect is used to express a past action or event that took place immediately before another action or event also past. It is never used except after some of the adverbs of time; *cuando*, when; *así que*, as soon as; *no bien*, no sooner, but just; *apénas*, scarcely; *luego que*, immediately after; *despues que*, soon after; as,

Apénas hubo salido cuando se cayó la casa, scarcely had-he gone-out when the house fell.

Cuando hube visto al muger, dije, when I-had seen the woman, I said.

Ni bien la hubimos hallado, cuando lo perdimos, no sooner had-we found it, when (than) we-lost it.

The first future tense affirms what is yet to be or to take place at a future time (mentioned or not); as,

Seré presidente, I-shall-be president.

Lucía vendrá mañana, Lucy will-come to-morrow.

The second future tense affirms something future that will have taken place before or at the time of some other future action or event, or determinate time; as,

Habré escrito esta carta ántes que Juan llegue, I shall-have written this letter before John may-arrive.

Habrá acabado á las tres, he-will-have finished at three o'clock.

Sometimes in Spanish the first future is used instead of the present, and the second future instead of the perfect indefinite, when something present or past is mentioned of which the speaker is not entirely certain; as, *ahora nos dirá lo que habrá visto*, now he-will-tell us that which he-shall-have seen, meaning, now he perhaps tells us what he perhaps has seen. When, however, the speaker is certain, then he would express himself thus: *ahora nos dice lo que ha visto*, how he-tells us what he-has-seen.

The second future in English is sometimes rendered in Spanish by the present tense in a sentence like the following: *mañana hará diez años que vivo en Nueva-York*, to-morrow it-will-be ten years that I-live in New York, meaning, I shall have lived in New York ten years to-morrow.

OF THE IMPERATIVE MOOD.

The imperative is that mood which commands, exhorts, or entreats; as,

Hacédlo, do-it.

Veámoslos, let-us-see-them.

Tráigamelos vmd., bring-them-to-me.

The imperative mood is not used in the first person singular; nor is it used in Spanish for forbidding, that is, it is not employed with a negative adverb, but the persons of the present subjunctive are used when a negative command or a prohibition is expressed; as,

No temas, fear not (*i.e.* mayest thou not fear).

No temais, fear not (*i.e.* may ye not fear).

The *s* of the first person plural and the *d* of the second are suppressed before *nos* and *os*; as,

Congratulémonos, let us congratulate ourselves.

Congratulád os, congratulate yourselves.

The *s* of the first person plural of the tenses of the indicative mood is suppressed when the reflective pronoun comes after it; as,

Amamonos, we-love ourselves.

When the imperative is negative in English, as the subjunctive is employed in Spanish, the pronouns of the first objective case are not joined to it, but come before it; as,

No lo hagas, do (thou) it not.

No me lo traigais, bring (ye) it not to-me.

No lo haga ella, let her not do it.

Que is sometimes used before the persons of the imperative mood; as,

Que uno de nosotros vaya, let one of us go (that one of us may-go).

The persons of the imperative, except the second persons, singular and plural, are to be rendered into English by "may" or "let;" as, *bendiganos el Señor*, may the Lord bless us; *vaya Juan*, let John go. But *vmd.*, with its objective cases, although of the third person, is to be rendered as the second person; as, *venga vmd. conmigo*, come with me, (let your-worship come with-me); *alábese vmd.*, praise yourself, (let your-worship praise himself).*

OF THE TENSES OF THE SUBJUNCTIVE MOOD.

The tenses of the subjunctive mood differ in signification from those of the indicative only in expressing what they affirm in a *conditional* or *doubtful* manner, while the tenses of the indicative express certainty. Whenever, therefore, there is no doubt about what we affirm, we must use the tenses of the indicative. Thus, if we say, *aunque Roderigo habla*, though Roderick speaks; by using the indicative mood we show that there is no uncertainty about Roderick's speaking: but if we say, *aunque Roderigo hable*, though Roderick may-speak, we show, by using the subjunctive mood, that it is not certain that Roderick will speak.

The present tense of the subjunctive affirms some doubtful

* In both Spanish and English the future is sometimes used as a command; as, *no matarás*, thou shalt not kill, *i. e.* do not kill, or do not commit murder.

action or event that may take place, and is generally preceded by some conjunction or conjunctive phrase; as,

Aunque sea así, though it-may-be so.
Estáte allí hasta que yo te lo diga, remain there until I may-tell it to-thee.
Haced esto para que vean vuestras buenas obras, do this in order that they-may-see your good works.
Que vivamos ó que muramos, del Señor somos, whether we-may-live or whether we-may-die, we are the Lord's.

As futurity is implied in the present tense of the subjunctive, the first future of the subjunctive may be used in its place; thus we may say, *aunque lloremos*, though we-may-weep; or *aunque lloraremos*, though we-should-weep. The present may, therefore, be used instead of the future, and the future instead of the present, unless the conjunction *si* (if) be employed, in which case the present subjunctive cannot be used.

The relative pronouns are generally followed by the present or some other tense of the subjunctive, when the sentence is interrogative or negative, or expresses a doubt, wish, or condition; as,

No conozco una sola muger, cuya alma sea mas sensible que la de la Señora Loader; I-know not a single woman whose soul (is) may-be more sensible than that of Mrs. Loader.

Words which in English are compounds of "ever," such as *quienquiera*, whoever; *cualquiera*, whosoever, whichsoever; *siempre que*, whenever; *por mas que*, however; *por mucho que*, whatever; in Spanish generally require the present or some of the tenses of the subjunctive; as,

Cualquier cosa que vea vmd., whatever thing that you may-see.
Por grande que sea tu mérito, however great that thy merit may-be.

The imperfect tense of the subjunctive affirms an action or event of a doubtful or contingent kind as having to be, or to be done, or as conceived by the mind as having taken place at some time under certain conditions; as,

Juan leeria, si tuviera libro, or *Juan leeria, si tuviese libros*, John would-read, if-he-should-have (if he had) books.
Quisiera que mi madre lo comiese, I-would-like (I-wish) that my mother would-eat-it.

There are in Spanish three forms of the imperfect subjunctive, one ending with *ra* (in the first person singular), another with *ría*, and the third with *se*. Each of these forms is generally to be rendered in English by some one of the auxiliaries should, would, might, or could, as the sense may require. These forms of the imperfect are thus used:—

The form ending with *se* is employed only when a conditional conjunction, or an ejaculatory expression of desire, or a verb of command or permission, comes before it; as,

Si yo tuviese libros, leeria, if I should-have books, I-would-read.
¡ Ojalá no arriesgase así su vida! O-that he-would-risk not thus his life!
Era preciso que espusiese mis razones, it-was necessary that I-should-explain my reasons.
Le dije que tomase esos libros, I-told him that he-might-take those books.

Sometimes the conjunction *que* is not expressed, but understood; as,

Encargó le enviasen mayor cantidad, he ordered (that) they-should-send him a greater quantity.

The form ending with *se* can be employed after the relative pronouns, and after *cuanto*, as much as, *cuantos*, as many as, when they are preceded by a verb expressive of an action which the other part of the sentence shows to depend on choice or mere contingency; as,

Prometió que me daría todo lo que le pidiese, he-promised me that he-would-give me everything which I-might-ask of-him.

The form ending with *ría* is employed (generally to express a *wish* or *condition*, or what *would be* or *might be* done) when no conditional conjunction comes immediately before the imperfect tense; as,

¿ Cual de los dos preferiria vmd.? which of the two would you prefer?
Si ella viniese, irian, If she should come, they-would-go.

This form can likewise be used when the imperfect is preceded by a verb that expresses *belief*, *trust*, or *promise*; and also when the conjunction *si* (if) is used in the sense of "whether;" as,

Prometió que me daría dos libros, he-promised that he-would-give me two books.
Le preguntó si su hijo iria allá, he-asked him if (whether) his son would-go there.

The form of the imperfect ending with *ra* may in general be used for either the form in *se* or that in *ría*; and is especially to be preferred to the form in *ría*, when interrogative pronouns come before the imperfect; as,

Si yo tuviera dinero, compraria libros, if I should-have (if I had) money, I-would buy books.
¿ Quien lo creyera? who would-believe it?
Ojalá me hallara con ella, O-that I-could-find myself with her.
Yo quisiera que viniesen, I-should-like that they would-come.

It will be seen from the foregoing rules that the form in *ra* can generally be used instead of the forms in *se* and *ría*, for we can say, *si yo amara*, or *si yo amase*, if I should love; and we can say, *él amara*, or *él amaría*, he would-love. But we cannot use the form in *ría* and that in *se*, the one for the other.

In English there are various forms of speaking of a contingent action or event; thus we can say, if she were to see it, were she to see it, should she see it, if she see it, could she see it, if she should see it; but in Spanish these forms must all be rendered as the last example—if she should see it, thus, *si ella lo viese*. And so with all the tenses of the subjunctive mood.

Sometimes the English auxiliaries, could, might, should, and would, are expressed in Spanish by a separate verb, followed by the infinitive; as,

No podia ver, he-could not see (was not able to-see).
Debia hacerlo, he-should do-it (ought to-do-it).
No queria entrar, he-would not enter (was not willing to-enter).

The perfect indefinite tense of the subjunctive mentions a doubtful or contingent action or event as being completed, or that it would have been done in past time under certain conditions; as,

Me admiro que no haya llegado, I-am-surprised that he-may not have arrived.
Poco me importa que lo haya oido decir ó no, it-concerns me little whether he-may-have-heard it spoken or not.
¿ Temes que no haya ganado en juego limpio? fearest-thou that he-may not have won in fair play?

The pluperfect tense of the subjunctive mentions a doubtful or contingent action or event that would or might have been completed under certain conditions; and is also used in Spanish whenever in English a conditional conjunction or expression of fear, doubt, or wish precedes the pluperfect indicative; as,

Ella habria ido ayer á la catedral si hubiese estado buena, she would-have gone yesterday to the cathedral, if she-had been well.
No era creible que hubiese vmd. abandonado á unos amigos antiguos como nosotros, it-was not credible that you would-have abandoned such old friends as we.
¡ Ojalá hubiese yo sido estudioso! O-that I had been studious!

This compound tense of the subjunctive is used with the endings in *ra*, *ría*, and *se* of the auxiliary verb *haber* (*hubiera*, *habria*, and *hubiese*), under the same conditions and in the

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same manner as these endings are employed in the imperfect tense; as,

Si no te hubiera pagado, yo te habria prestado dinero; or, *si no te hubiese pagado, yo te habria prestado dinero;* or, *si no te hubiese pagado, yo te hubiera prestado dinero;*	or, *si no te hubiera pagado, yo te hubiera prestado dinero;* if he-should not have (if he-had not) paid thee, I would-have lent thee money.

The form of the last example, though permitted, is not to be recommended, since the ending *ra* occurs in the conditional proposition (*si no te hubiera pagado*), and also in the principal proposition (*yo te hubiera prestado dinero*). Nor could we change in any case the principal proposition of the sentence, by substituting *hubiese prestado*, since the form in *se* can be employed only with conditional conjunctions or exclamations, etc.

There is in Spanish a peculiar method sometimes employed for expressing such a contingency of an action as is implied in the pluperfect tense: this consists in prefixing the preposition *á* before the infinitive *haber*, and affixing the past participle of the verb to be used; thus, *á haber venido* is to be rendered the same as *si hubiera* (or *hubiese*) *venido*, if he-should-have come, or, as it is generally expressed in English, if he had come, or, had-he come. So *á haber hablado* is to be rendered the same as *si hubiese hablado*, if he-had spoken.

The first future tense of the subjunctive mentions a doubtful or contingent action or event as to take place at a future time; as,

Si así fuere, mis deseos quedarán satisfechos, if thus it-should-be, my desires will-remain satisfied.	*viera caridad, nada soy,* if I should-speak languages of men and of angels, and should not have charity, I-am nothing.
Si yo hablare lénguas de hombres y de ángeles, y no tuviera caridad, nada soy, if I should-speak languages of men and of angels, and should not have charity, I-am nothing.	

The imperfect and first future of the subjunctive cannot be used indiscriminately for each other. The contingency implied in the imperfect refers to time past; and that implied in the first future refers to future time, reckoning from the moment in which it is said. Thus if we say, John said that the boys should remain at home, there is contingency and even futurity denoted, but it does not necessarily go beyond the present moment, for the boys may have already complied with John's request. In such a case the imperfect must be used. But if we say, John says that if the boys should (or shall) not remain at home, he will not reward them, then it is evident that the event of staying at home is not yet supposed to have taken place, and of course the first future subjunctive is used. So, if I have (*i.e.* shall have) money, they will-rob me of it, would be expressed by the first future, and, if I had (should have) money, I would be generous, would be expressed by the imperfect.

The second future of the subjunctive mentions a doubtful or contingent action or event as having taken place at a future time at or before some other future action or event shall occur; as,

Si Pedro no hubiere llegado ántes de amanecer, le escribiré una carta, if Peter shall not have arrived before daybreak, I-shall-write him a letter.	

A verb is not necessarily in the subjunctive mood because a conjunction may precede it; for an action or event which is known to be certain requires the verb to be in the indicative mood, even though a conjunction precede it; as, though John was-speaking low, I heard him distinctly, *aunque Juan hablaba*, etc. If, however, there is uncertainty or doubt expressed, the subjunctive mood is required; as, though John were-speaking, I would not listen, *aunque Juan hablara*, etc.

On account of the irregular and elliptical manner of using the tenses in English, it is sometimes difficult for the learner to know which to use in Spanish. But he must learn to distinguish the meaning of the English tense, whether certainty or uncertainty is expressed.

After the relative pronouns or the adjective *cuanto*, "how much," or the adverb *cuando*, "when," if these pronouns or this adjective or adverb are themselves preceded by a verb expressive of an action which the other part of the sentence shows to depend on mere choice or contingency, the subjunctive mood is used, though in English in such cases the indicative is generally employed; as,

Elige, pues, de estas naranjas la que mas te agrade (or *ogradare*), choose, then, from these oranges that which most pleases thee (may-please or shall-please thee).	shall-be rich when fortune wills (*i.e.* when fortune may-will or shall-will).
Seré rico, cuando quiera (or *quisiere*) *la fortuna,* I-shall-be rich when fortune wills (*i.e.* when fortune may-will or shall-will).	*Prometió darme el dinero que yo necesitara,* he-promised to-give me the money that I-wanted (might-want).

Verbs expressing will, desire, command, permission, promise, fear, doubt, probability, fitness, or necessity, followed by the conjunction *que* (or any other conditional conjunction), generally require the verb which follows the conjunction to be in the subjunctive mood (and not in the indicative, as in English); as,

Dudo que tengas aceite, I-doubt whether thou-hast (mayest-have) oil.	have (may not have) money.
No creo que tenga peras, I-do not think that he-has (may-have) pears.	*Es posible que tengan uvas,* it-is possible that they-have (may-have) grapes.
Temo que no tengan dinero, I-fear that they-will not have (may not have) money.	*Es preciso que me vaya,* it-is necessary that I-go (may-go).

There are some conjunctive phrases, which, as they imply a condition or doubt in themselves, are always followed by the subjunctive mood: these are, *para que*, in order that; *dado que*, granted that; *no sea que*, lest; *á ménos que*, unless; *á fin de que*, to the end that; *con tal que*, provided that; *ántes que*, before that; *supuesto que*, suppose that; *en caso de que*, in case that; *bien que*, although; *sin que*, without or unless that; *como quiera que*, notwithstanding that; *por mas que*, however; *siempre que*, whenever that; *ojalá*, would that, or, would to God that; as, *hablo para que puedas juzgar*, I-speak in order that thou-mayest be able to judge.

The conjunction ought always to be expressed in Spanish; as, he promised us [that] he would come, *nos prometió que vendría.*•

THEORY AND PRACTICE OF TEACHING.
No. IV.

RIGHT VIEWS OF EDUCATION

EVERY teacher, before he begins the work of instruction, should have some definite idea of what constitutes an education; otherwise he may work to a very little purpose. The painter who would execute a beautiful picture, must have beforehand a true and clear conception of beauty in his own mind. The same may be said of the sculptor. That rude block of marble, unsightly to the eyes of other men, contains the godlike form, the symmetrical proportion, the life-like attitude of the finished and polished statue; and the whole is as clear to his mental eye before the chisel is applied as it is to his bodily vision when the work is completed. With this perfect *ideal* in the mind at the outset, every stroke of the chisel has its object. Not a blow is struck, but it is guided by consummate skill; not a chip is removed, but to develope the ideal of the artist. And when the late unsightly marble, as if by miraculous power, stands out before the astonished spectator in all the perfection of beauty,—when it almost breathes and speaks,—it is to the artist but the realisation of his own conception.

Now let the same astonished and delighted spectator, with the same instruments, attempt to produce another statue from a similar block. On this side he scores too deep, on the other he leaves a protuberance; here by carelessness he encroaches upon the rounded limb; there by accident he hews a chip from off the nose; by want of skill one eye ill-mates the other; one hand is distorted as if racked by pangs of the gout; the other

• The verb *prometir* is generally followed by the infinitive in such a case thus, *prometió darme el dinero*, he-promised to-give me the money.

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is paralyzed and deathlike. Such would be his signal failure. Thus he might fail a thousand times. Indeed it would be matter of strange surprise if in a thousand efforts he should once succeed.

Now the difference between the artist and the spectator lies chiefly in this,—the one knows beforehand what he means to do; the other works without any plan. The one has studied beauty till he can see it in the rugged block; the other only knows it when it is presented to him. The former, having an ideal, produces it with unerring skill; the latter, having no conception to guide him, brings out deformity.

"What sculpture is to the block of marble," says Addison, "education is to the human soul;" and may we not add, that the sculptor is a type of the true educator,—while the spectator of whom we have been speaking, may aptly represent too many false teachers, who without study or forethought enter upon the delicate business of fashioning the human soul, blindly experimenting amidst the wreck of their heaven-descended material, maiming and marring, with scarcely the possibility of final success, almost with the certainty of a melancholy failure!

In other things besides education men are wiser. They follow more the teachings of nature and of common sense. But in education, where a child has but one opportunity for mental training, as he can be a child but once,—where success, unerring success, is everything to him for time and eternity, and where a mistake may be most ruinous to him,—in education, men often forget their ordinary wisdom and prudence, and commit the most important concerns to the most incompetent hands. "The prevailing opinions," says Emerson, "in regard to this art are such as the common sense of mankind and the experience of centuries have shown to be absurd as to every other art and pursuit of civilised life. To be qualified to discourse upon our moral and religious duties, a man must be educated by years of study; to be able to administer to the body in disease, he must be educated by a careful examination of the body in health and in disease, and of the effects produced on it by external agents; to be able to make out a conveyance of property, or to draw a writ, he must be educated; to navigate a ship, he must be educated by years of service before the mast or on the quarter-deck; to transfer the products of the earth or of art from the producer to the consumer, he must be educated; to make a hat or a coat, he must be educated by years of apprenticeship; to make a plough, he must be educated; to make a nail or a shoe for a horse or an ox, he must be educated;—but to prepare a man to do all these things—to train the body in its most tender years, according to the laws of health, so that it should be strong to resist disease; to fill the mind with useful knowledge, to educate it to comprehend all the relations of society, to bring out all its powers into full and harmonious action; to educate the moral nature, in which the very sentiment of duty resides, that it may be fitted for an honourable and worthy fulfilment of the public and private offices of life; to do all this is supposed to require no study, no apprenticeship, no preparation!"

Many teachers, therefore, encouraged by this unaccountable indifference in the community, have entered the teacher's profession without any idea of the responsibilities assumed or of the end to be secured by their labours, aside from receiving at the close of their term the compensation for their service in pecuniary payments. And even many who have entered this profession with good intentions, have made the most deplorable mistakes from a want of an adequate idea of what constitutes an education. Too often has educating a child been considered simply the act of imparting to it a certain amount of knowledge, or of "carrying it through a certain number of studies, more or less." Education has too frequently been held to be a cultivation of the intellectual to the neglect of the moral powers; and the poor body, too, except among savages, has had but little share in its privileges or benefits. In a very large number of our schools, the physical and the moral have both been sacrificed to the intellectual. Even some of our public speakers have dwelt upon the necessity of *intelligence* to the perpetuity of our free institutions, scarcely seeming to be aware that intelligence, without moral principle to direct and regulate it, might become the very engine through which evil men might effect our overthrow. Who has not seen that an educated man without virtue is but the more capable of doing evil? Who does not know that knowledge misdirected becomes, instead of a boon to be desired, a bane to be deprecated?

From what has been said, we place it among the highest qualifications of the teacher that he should have *just views of education*. We consider it all important that he should have a well-defined object at which to aim, whenever he meets a young mind in the transition state. He should have an *ideal* of a well-educated human soul, tenanting a healthy, well-developed human body; an ideal which he at once and systematically labours to reach, as does the sculptor when he commences his work upon the quarried marble. "What is it to educate a human being aright?" should be one of the first questions the candidate for the teacher's office should ask himself with the deepest seriousness. We say the *candidate;* for this question should be settled if possible *before* he begins his work. It is a great question, and he *may* not be able to answer it in a day. Let him consult the dictates of his own mind,—let him consult the teachings of experience and of wisdom, as they are to be found in the writings of Milton, Locke, Wyse, Cousin, Brougham, and others. Let him, enlightened by all this, carefully observe human nature around him; consider its tendencies, its wants, and its capabilities; and after a patient survey of all the truth he can discover upon the subject, let him come to an honest conclusion as to what is a correct answer to the query with which he started—"What is it to educate a human being aright?"

The conclusions of the honest and intelligent inquirer after the truth in this matter will be something like the following:—That education (from *e* and *duco*, to lead forth) is development; that it is not instruction merely — knowledge, facts, rules—communicated by the teacher, but it is discipline, it is a waking up of the mind, a growth of the mind,—growth by a healthy assimilation of wholesome aliment. It is an inspiring of the mind with a thirst for knowledge, growth, enlargement,—and then a disciplining of its powers so far that it can go on to educate itself. It is the arousing of the child's mind to think, without thinking for it; it is the awakening of its powers to observe, to remember, to reflect, to combine. It is not a cultivation of the memory to the neglect of everything else; but it is a calling forth of all the faculties into harmonious action. If to possess facts simply is education, then an encyclopædia is better educated than a man.

It should be remarked that though knowledge is not education, yet there will be no education without knowledge. Knowledge is ever an incident of true education. No man can be properly educated without the acquisition of knowledge; the mistake is in considering knowledge the *end*, when it is either the *incident* or the *means* of education. The discipline of the mind, then, is the great thing in intellectual training; and the question is not, how much have I acquired!—but, how have my powers been strengthened in the act of acquisition?

Nor should the intellectual be earlier cultivated than the moral powers of the mind. The love of moral truth should be as early addressed as the love of knowledge. The conscience should be early exercised in judging of the character of the pupil's own acts, and every opportunity afforded to strengthen it by legitimate use. Nor should the powers of the mind be earlier cultivated than those of the body. It is the theory of some, indeed, that the body should engross most of the attention for several of the first years of childhood. This we think is not nature's plan. She cultivates all the powers at once,—the body, mind, and heart. So should the teacher do. "Education," in the pertinent language of Mr. Fox, "has reference to the *whole man*, the body, the mind, and the heart; its object, and when rightly conducted, its effect is, to make him a complete creature after his kind. To his frame it would give vigour, activity, and beauty; to his senses, correctness and acuteness; to his intellect, power and truthfulness; to his heart, virtue. The educated man is not the gladiator, nor the scholar, nor the upright man, alone; but a just and well-balanced combination of all three. Just as the educated tree is neither the large root, nor the giant branches, nor the rich foliage, but all of them together. If you would mark the perfect man, you must not look for him in the circus, the university or

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the church exclusively; but you must look for one who has '*mens sana* in *corpore sano*'—a healthful mind in a healthful body. The being in whom you find this union, is the only one worthy to be called educated. To make all men such is the object of education."

We have dwelt thus fully on this subject, because it is so obvious that egregious mistakes are made in education. How many there are who are called "good scholars" in our schools of whom we hear nothing after they go forth into the world. Their good scholarship consists in that which gives them no impulse to go on to greater attainments by themselves. Their learning is either that of *reception*—as the sponge takes in water—or that of mere memory. Their education is not discipline; it kindles none of those desires which nothing but further progress can satisfy; it imparts none of that self-reliance which nothing but impossibilities can ever subdue. While these are pointed out by their teachers as the ornaments of their schools, there are others known as the heavy, dull, "poor scholars," in no way distinguished but by their stupidity,—of whom no hopes are entertained, because of them nothing is expected,—who in after-life fairly outstrip their fellows and strangely astonish their teachers. Almost every teacher of fifteen years' experience has noticed this. Now why is it so? There must have been somehow in such cases a gross misjudgment of character. Either those pupils who promised so much by their quickness were educated wrong, and perhaps educated too much, while their teachers unwittingly and unintentionally educated their less distinguished companions far more judiciously; or else nature in such cases must be said to have been playing such odd pranks that legitimate causes could not produce their legitimate effects. We must charge nature as being extremely capricious, or we must allege that the teachers entirely misunderstood their work, failing where they expected most, and succeeding as if by chance—almost against their will—where they expected least. We incline to the latter alternative; and hence we infer that there is such a thing as teaching a mind naturally active too much—exciting it too much,—so that it will prematurely exhaust its energies and gladly settle back into almost imbecility; and that there is such a thing as leaving the mind so much to its own resources, that without dazzling the beholder like the flash of the meteor when it glares upon the startled vision, it may be silently gathering materials to support the more enduring light of the morning star, which anon will arise in majesty and glory.

It will be well for our youth when our teachers shall so understand human nature, and so comprehend the science and the art of education, that these mistakes shall seldom occur; and when he who tills the nobler soil of the mind shall, with as much faith and as much certainty as he who tills the literal field, rely upon the fulfilment of heaven's unchangeable law: "Whatsoever a man soweth, that shall he also reap."

RIGHT MODES OF TEACHING.

From what has been said of education, it is very obvious that it is no small thing to be a successful teacher. It is admitted by all that the teacher should be APT TO TEACH. He cannot be useful without this. He may have an unimpeachable character; he may have the most liberal and thorough literary acquirements; he may deeply feel his responsibility, and yet after all he may fail to teach successfully.

Aptness to teach has been said to be a native endowment, a sort of instinct, and therefore incapable of being improved by experience or instruction—an instinct such as that which guides the robin, though hatched in an oven, to build a perfect nest like that of its parent, without ever having seen one. We are of opinion that such instincts in men are rare; but that aptness to teach, like aptness to do anything else, is usually an acquired power, based upon a correct knowledge of what is to be done, and some accurate estimate of the fitness of the means used for the end. If there are exceptions to this, they are very uncommon; and the safer way, therefore, for the majority of teachers is, to study carefully the *rationale* of their processes, and to rely rather upon sound and philosophical principles in their teaching, than upon a very doubtful intuition.

One of the most common errors into which young teachers fall (and some old ones too), is that misjudging of the degree of assistance which the young scholar needs in the pursuit of learning. There are a few who forget the difficulties which impeded their own perception of new truths when learners, and therefore have no sympathy with the perplexities which surround the children under their charge when they encounter like difficulties. They refuse to lend a helping hand even where it is needed, and by making light of the child's doubts, perhaps sneering at his unsuccessful struggles, they dishearten him so far that imaginary obstacles become insurmountable, and he gives up in despair. But a far more numerous class tend towards the other extreme. From a mistaken kindness, or a mistaken estimate of the child's ability, or both, they are disposed to do quite too much for him, and thus they diminish his power to help himself. The child that is constantly dandled upon the lap of its nurse, and borne in her arms to whatever point it may desire to go, does not soon learn to walk; and when it at length makes the attempt, it moves not with the firm tread of him who was early taught to use his own limbs. There is a great deal of literary dandling practised in our schools; and as a consequence, a great many of our children are mere sickly nurselings, relying upon leading strings while in the school, and falling for very weakness just as soon as the supporting hand is withdrawn. This evil is so common, and in some instances so monstrous, that we shall be pardoned if we dwell upon it a little more fully.

In illustrating this subject, we must mention two processes of teaching, not indeed exactly opposite to each other, though widely different,—into one or both of which many of our teachers are very liable to fall. We shall, for the sake of a name, designate the former as the

POURING-IN PROCESS.

This consists in *lecturing* to a class of children upon every subject which occurs to the teacher, it being his chief aim to bring before them as many facts in a limited time as possible It is as if he should provide himself with a basket of sweetmeats, and every time he should come within reach of a child, should seize him, and compel him to swallow—regardless of the condition of his stomach—whatever trash he should happen first to force into his mouth. Children are indeed fond of sweetmeats, but they do not like to have them *administered*,—and every physiologist knows there is such a thing as eating enough even of an agreeable thing to make one sick, and thus produce a loathing for ever after. Now, many teachers are just such misguided caterers for the mind. They are ready to seize upon the *victims* of their kindness, force open their mental gullets, and pour in, without mercy and without discretion, whatever sweet thing they may have at hand, even though they surfeit and nauseate the poor sufferer. The mind, by this process, becomes a mere *passive recipient*, taking in without much resistance whatever is presented till it is full.

"A passive recipient!" said one to his friend, "what is a *passive recipient?*" "A passive recipient," replied his friend, "is a *two-gallon jug*. It holds just two gallons, and as it is made of potter's ware, it can never hold but just two gallons" This is not an unfit illustration of what we mean by making the mind a passive recipient. Whenever the teacher does not first excite inquiry, first prepare the mind by *waking it up* to a desire to know, and if possible to find out by itself, but proceeds to think *for* the child, and to give him the results, before they are desired, or before they have been sought for,—he makes the mind of the child a *two-gallon jug*, into which he may pour just *two gallons*, but no more. And if day after day he should continue to pour in, day after day he may expect that what he pours in will *all run over*. The mind, so far as retention is concerned, will act like the jug; that is, a part of what is poured in to-day, will be diluted by a part of that which is forced in to-morrow, and that again will be partially displaced and partially mingled with the next day's pouring, till at length there will be nothing characteristic left. But aside from retention, there is a great difference between the jug and the mind. The former is inert material, and may be as good a jug after such use as before. But the mind suffers by every unsuccessful effort to retain.

This process of lecturing children into imbecility is altogether too frequently practised; and it is to be hoped that intelligent teachers will pause and inquire before they pursue it further.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXXV.

(*Continued from page* 339.)

METEOROLOGY.

Object of Meteorology.—The name of *meteors* is applied to the phenomena produced in the atmosphere, and that of *meteorology* to the branch of natural philosophy which has for its object the study of meteors.

Meteors are divided into *aerial*—such as winds and tempests; *aqueous*, or watery—comprehending fogs, clouds, rain, dew, snow, and hail; and *luminous*, as lightning, the rainbow, and the aurora-borealis or northern lights.

AERIAL METEORS.

Direction and Velocity of the Winds.—*Winds* are currents in the atmosphere, varying greatly in direction and velocity. Although they blow in all directions, there are eight principal directions: the *north, north-east, east, south-east, south, south-west, west, and north-west.*

The direction of the wind is indicated by weathercocks, and its velocity by the *anemometer*, or wind-measurer. This latter is a sort of windmill, from the number of revolutions of which in a given time, the velocity of the wind is deduced.

Causes of Winds.—Winds are caused by a disturbance of the equilibrium in some part of the atmosphere, a disturbance always resulting from a difference in the temperatures of two neighbouring countries. For example, if the temperature of the earth is raised over a certain extent of surface, the air in contact with it becomes heated, expands, and rises to the upper regions of the atmosphere, where it spreads, causing winds which blow from warm countries to cold ones. Further, the equilibrium being at the same time destroyed at the level of the ground by the excess of weight in the upper strata of the atmosphere, the air is there displaced, and currents are consequently produced in a direction contrary to that of the winds above-mentioned.

Regular, Periodical, and Variable Winds.—According to the greater or less constancy of winds they are classified under three great divisions: regular, periodical, and irregular, or variable winds.

1. The name of *regular winds* is applied to those which blow all the year in nearly the same direction. These winds, which are also known under the name of *trade winds*, are observed at a distance from land, blowing from north-east to south-west in the northern hemisphere, and from the south-east to the north-west in the southern hemisphere. They prevail on both sides of the equator for about thirty degrees, and their direction is that of the apparent motion of the sun, *i.e.* from east to west.

Trade winds, like other winds, being caused by variations of temperature in the atmosphere, are generally explained by the heat of the sun acting in the direction of its apparent motion from east to west.

2. *Periodical Winds* are those which blow regularly in the same direction at the same seasons of the year or the same hours of the day; such as the monsoon, the simoom, and the breese. The name of *monsoon* is applied to winds which blow for six months in one direction and six months in another. They are principally observed in the Arabian Sea, the Arabian Gulf, the Bay of Bengal, and the China Sea. These winds blow towards the mainland in summer, and in the contrary direction in winter.

The *simoom* is a burning wind which blows in the deserts of Asia and Africa, and which is characterised by its high temperature and the sand which it raises in the air and carries along with it. When this wind blows, the air is darkened, the skin is dried, respiration is shortened, and extreme thirst is experienced.

This wind is known by the name of *sirocco* in Italy and Algiers, where it blows from the great desert of Sahara. It bears the name of *shamsin* in Egypt, where it is experienced from the end of April till June. To guard against the effects of too rapid a cutaneous evaporation occasioned by this wind, the natives of Africa cover their bodies with grease.

Fig. 467.



The *breeze* is a wind which blows at the sea-coast, from the sea towards land during the day, and from the land towards the sea during the night; that is to say, from the warmest quarter in each case. Sea and land breezes are only felt at short distances from the coast. Breezes are regular between the tropics, less so in our latitude, and traces of them are observable even on the coasts of Greenland. The neighbourhood of mountains very frequently gives rise to periodical day-breezes.

3. *Changeable Winds* are those which blow sometimes in one direction and sometimes in another, without our being able to ascertain the law to which they are subject. In temperate climates the direction of the winds is very variable, the irregularity increases as we advance nearer the poles, and at the north pole the winds sometimes blow from several points of the compass at once. On the contrary, as we approach the torrid zone, they become more regular. The south-west wind prevails most in England, Germany, and the north of France.

In the south of France the direction inclines more to the north, and in Spain and Italy the north wind prevails most.

Water-spouts are masses of vapour in suspension in the lower strata of the atmosphere, and subject to a rotatory motion which is rapid enough to root up trees, overthrow houses, and break and destroy everything they encounter.

These meteors are generally accompanied by hail and rain, often give out flashes of light, and make a noise like that of a cart upon a stony road. Many of these water-spouts have no rotatory motion, and about one-fourth of those that have been observed have arisen in a calm state of the atmosphere.

Water-spouts are observed at sea as well as upon land, and the phenomenon then presents a remarkable aspect. The waters of the sea are violently agitated and rise in the form of a cone, while the clouds descend in the shape of a cone reversed, and the two cones are joined at their points so as to form a continuous column from the sea to the clouds, fig. 487. In the open sea, however, the water of the water-spout is never salt, which proves that they are principally formed of condensed vapours, and not of sea-water raised by suction.

The origin of water-spouts is not known. M. Kœmtz considers that they are chiefly produced by two contrary winds passing by the side of each other, or by a very brisk wind in the upper regions of the atmosphere. Peltier and many other philosophers attribute them to an electric cause.

AQUEOUS METEORS.

Fogs.—These are masses of vapour which, being condensed in the atmosphere in a vesicular state, occupy its lower regions and destroy its transparency.

Fogs are formed when the moist ground is warmer than the air. The vapours which ascend are then condensed and become visible. It is necessary, however, that the air should reach the point of saturation, or the state in which it ceases to be capable of retaining vapour in an uncondensed form; otherwise condensation does not take place. Fogs may also take place when a current of warm moist air passes over a river, the temperature of which is lower, for the air being then cooled, condensation of the vapours takes place immediately.

Clouds are also collections of vapours in a vesicular state, as well as fogs, from which they differ only in occupying the higher regions of the atmosphere. They always result from the condensation of the vapours which rise from the earth. According to the appearances which they present, clouds are divided into four principal species, severally named, *cirri*, *cumuli*, *strati*, and *nimbi*.

Cirri are small bluish clouds presenting the appearance of loose threads, like carded wool. They are the highest clouds, and on account of the low temperature of the regions they occupy, are considered to be formed of frozen particles or flakes of snow. Their appearance often precedes a change of weather.

Cumuli are clouds rounded off and presenting the appearance of mountains piled one upon the other. They are more frequent in summer than in winter, and, after being formed in the morning, are generally dispersed in the evening. If, on the contrary, they become more numerous, and especially if they are surmounted by *cirri*, rain or storms may be expected.

Strati are horizontal cloudy layers, very large and unbroken, which are formed at sun-set, and are dispersed at sun-rise. They are lower than the preceding species.

Lastly, *nimbi*, or rain-clouds, are clouds which do not appear in any particular form, but are distinguished only by a uniform grey colour and fringed borders.

The height of the clouds is very variable, the average being from four to five thousand feet. But it is often much greater. Gay Lussac, in a balloon ascent, at a height of about twenty-two thousand feet from the level of the sea, observed *cirri* above him which appeared at a considerable height from him.

M. d' Abbadie observed in Ethiopia stormy clouds which were not more than about six hundred and seventy feet from the ground.

To explain the suspension of clouds in the atmosphere, the vesicles of which they are formed have been compared to so many small balloons full of air warmer than the surrounding atmosphere, and produced by the absorption of the sun's heat.

M. Koemtz, in his treatise on meteorology, refutes this opinion, and maintains that the ascending currents of warm air suffice to raise the vesicular vapours, just as winds raise dust, sand, and all light bodies. According to this philosopher, clouds are not generally immovable, as they appear, in a vertical direction. More frequently they descend slowly, but the lower part of them is continually dispersed in the warmer strata that they pass through, while the upper part incessantly receives additions of fresh vesicles, which accounts for their apparent immovability.

Rain is the fall, in drops, of the water proceeding from the vesicles of the clouds when they are liquefied by the lowering of the temperature. If in its descent the rain passes through a dry atmosphere, the drops tend to evaporation, and less rain falls upon the ground than at a certain height above it. This is observed at the observatory in Paris, where the quantity of rain which falls in the court is greater than on the terrace.

The quantity of rain which falls annually in any place is measured by means of an apparatus called the *pluviometer* (rain-measurer) or *udometer* (moisture-measurer). It is a cylindrical vessel, the upper cover of which, in the shape of a reversed cone, has a small hole at the apex, so as to allow the rain-water to go through, but to prevent evaporation as much as possible. A glass tube at the side connected with the interior enables one to see the level of the water in the vessel, and a graduated scale shows the height. This apparatus being put in an open place, if at the end of a month, for example, the height of the water is two inches, this shows that in the vessel the water has reached that height, and consequently that, if the rain that has fallen were spread over the ground without evaporation or filtration, there would be a depth of two inches.

A great number of local circumstances may cause a variation in the quantity of rain which falls in different countries, but, all other things being equal, it is in warm countries, and in warm seasons, that most rain is to be expected.

BIOGRAPHY.—No. XXVI.

CATHARINE MARIA SEDGWICK.

Miss Sedgwick was born in Stockbridge, Massachusetts. Her father, the Hon. Theodore Sedgwick, a citizen of high reputation, was at one time Speaker of the House of Representatives, afterwards senator in Congress, and, at the time of his death, filled the office of judge of the supreme court of his state. Miss Sedgwick's first book, the "New England Tale," appeared in 1822. It was originally written for a religious tract; but as it gradually expanded into a work too large for such a purpose, she was prevailed on, with much difficulty, by her friends, to give it to the world in its present form. It was received with such favour, that in 1827 the authoress was induced to publish her second work, a novel in two volumes, entitled "Redwood." This work met with great success, and was republished in England and translated into French and Italian. One of the characters in the book, Miss Debby Lennox, bears the stamp both of originality and truthfulness, and if it stood alone, would prove not only the extensive observation, but the great powers of invention possessed by its delineator. Miss Sedgwick's next work was "Hope Leslie, or Early Times in America," a novel in two volumes, published in 1827. This has continued to be her most popular tale; and, indeed, no novel written by an American, except, perhaps, the early works of Cooper, ever met with such success. The character of the heroine is a lovely embodiment of womanhood with all its ideal perfections, and yet with a few natural weaknesses which only render her the more life-like and interesting. The Indian girl, Magawisca, seems to be more a being of the imagination; too high-souled and lofty, as well as too refined, to be a true type of the race from which she sprung. In 1830, "Clarence, a Tale of our own Times," appeared; in 1832, "Le Bossu," one of the Tales of Glauber Spa; and in 1835, "The Linwoods, or Sixty Years Since, in America." During the same year she collected in one volume the shorter tales which had appeared in different periodicals; and in 1836 she published her popular story of "The Poor Rich Man and the Rich Poor Man;" in 1837, "Live and Let Live;" in 1838, "Means and Ends, or Self-Training;" and afterwards, "A Love Token for Children," and "Stories for

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Young Persons." In 1840 she published her "Letters from Abroad to Kindred at Home," in two volumes; and not long after, a "Life of Lucretia M. Davidson." She has also been a frequent contributor to annuals and periodicals. For the Lady's Book she wrote her thrilling novel, "Wilton Harvey." In the same magazine was published "A Huguenot Family," "Scenes from Life in Town," "Fanny Mc Dermot," etc. A writer in the National Portrait Gallery thus truly estimates the characteristics of her genius:—

"It is evident that Miss Sedgwick's mind inclines towards cheerful views of life. There seems to be implanted in her heart a love of goodness and of the beautiful, which turns as naturally towards serenity and joy, as flowers turn towards the sun. It is manifest that though possessing great refinement herself, her sympathies are not confined to a coterie or class, but that they are called forth by every manifestation of virtue, even in the most humble circumstances, and that she looks with kind regard upon those gleams of a better nature which occasionally break forth amid prevailing clouds and darkness.

"She affects no indifference to the accidental advantages of condition. It would be impossible to diminish her interest in the powers and fascinations of genius and imagination, and she thinks it no duty to attempt it. But her highest favour and affection are reserved for that enduring virtue which is perfected through much trial and tribulation, and which needs no earthly witness or outward reward. She delights to see the 'signet of hope upon the brow of infancy;' but she remembers with more satisfaction the last smile of unfaltering faith and love, which even death itself spares for a season.

"It is impossible to speak of her works without a particular regard to their moral and religious character. We know no writer of the class to which she belongs who has done more to inculcate just religious sentiments. They are never obtruded, nor are they ever suppressed. It is not the religion of observances, nor of professions, nor of articles of faith, but of the heart and life. It always comes forth; not as something said or done from a sense of necessity or duty, but as part of the character, and inseparable from its strength, as well as from its grace and beauty. It is a union of that faith which works by love with that charity which never faileth.

"There is another characteristic of Miss Sedgwick's writings which should not be overlooked. We allude to their great good sense and practical discretion; the notableness which they evince and recommend. This is so true, that we recollect having heard a zealous utilitarian declare, after reading one of her works, that political economy might be taught to the greatest advantage through the medium of romances."

Her style is peculiarly good; equally free from stiffness and negligence, it is more distinguished by delicacy and grace than strength, and the purity of her English may afford a model to some of our learned scholars.

Miss Sedgwick is evidently an ardent admirer of nature, and excels in describing natural scenery. She has also great powers both of invention and imagination, and delineates character with wonderful skill. Her children are, to a certain point, beautifully and naturally described; but there are in the mind of this writer two antagonistic principles—the usefully practical, and the sentimentally romantic. This is by no means uncommon with delicate and refined minds; they like to deviate into regions beyond the every-day world, yet sense and circumstances recall them to common truths; hence arise little discrepancies which mar in some degree the naturalness of the delineations. Miss Edgeworth is almost the only writer of children's books who has entirely avoided this fault; but it is difficult to arrive at this excellence, and it is no disparagement to Miss Sedgwick to say she has not attained it. With every abatement that can be made, Miss Sedgwick remains among the front rank of those earnest and sincere writers whose talents have been employed for the purpose of doing good, and whose works have obtained a great and deserved popularity. Her books have, almost without exception, been reprinted and favourably received in England.

MR. AIKIN'S PHILOSOPHY.

"I must say, I think there is a useless and senseless outcry against rich men. It comes from the ignorant, unobserving, and unreflecting. We must remember that in our country there are no fixed classes; the poor family of this generation is the rich family of the next; and more than that, the poor of to-day are the rich of to-morrow, and the rich of to-day the poor of to-morrow. The prizes are open to all, and they fall without favour. Our rich people, too, are, many of them, among the very best persons in society. I know some such: there is Mr. Beckwith; he has ten talents, and a faithful steward is he; he and his whole family are an honour and blessing to their country; doing in every way all the good they can. Such a rich man as Morris Finley I despise, or rather pity, as much as you or any man can; but pray do not let us envy him his riches; they are something quite independent of himself; and can a man be really poorer than he is?—a poor mind, a poor heart—that is the poverty to shun. As to rich men being at their ease, Miner, every acquisition brings a new want—a new responsibility."

"But, Aikin, Aikin; now, candidly, would you not be willing to take their wants and responsibilities with their purses?"

"I cannot say, Miner; money is the representative of power—the means of extended usefulness; and we all have dreams of the wonderful good we should do if we had these means in our hands. But this I do know—that, till we are conscious of employing, and *employing well*, the means we have, we ought not to crave more. But let us look at the matter in the right point of view. We are all children of one family; all are to live here a few years; some in one station, and some in another. We are all of us, from the highest to the lowest, labourers in our Father's field; and *as we sow, so shall we reap*. If we labour rightly, those words of truth and *immense* import will sound in our ears like a promise, and not like a threat. We shall work at our posts like faithful children, not like tasked slaves; and shall be sure of the riches that perish not in the using. As to all other riches, it is not worth our while to covet or envy them; except in some rare cases, we have all, in this country, gifts and means enough."

THE POOR RICH MAN'S BLESSINGS.

"I had a good education. I do not mean as to learning; that is only one part of it; I was taught to use my faculties. But, first and best of all, I early learned to seek the favour of God and the approval of conscience. I have always had a cheerful home, a clean room to come to, clean children, and a nice wife. Your mother has performed her duties, great and small. As to the small, she never has failed a day since we were married to put on her *t'other* gown at evening, and a clean cap with a riband bow, most always of blue, the colour she knows I like best. Her trade has helped us through many a hard-rubbing day, and it has given me peace of mind; for I know if I were taken from you, she could and would support you without running to any widows' societies or assistant societies."

HIS ADVICE TO HIS CHILDREN.

"Observe for yourselves, my children; and don't trust to what others tell you. If you make good use of your bodily eyes and the eyes of your mind, you will see that Providence has bound the rich and the poor by one chain. Their interests are the same; the prosperity of one is the prosperity of all. The fountains are with the rich, but they are no better than a stagnant pool till they flow in streams to the labouring people. The enterprise and success of the merchant give us employment and rich rewards for our labour. We are dependent on them, but they are quite as dependent on us. If there were none of these hateful rich people, who, think you, would build hospitals and provide asylums for orphans, and for the deaf and dumb, and the blind?"

HIS REMARKS ON MANNERS.

"Manners, for the most part, are only the signs of qualities. If a child has a kind and gentle disposition, he will have the outward sign; if he have the principle that teaches him to maintain his own rights and not encroach on those of others, he will have dignity and deference, which I take to be qualities of the best manners. As to forms of expression, they are easily taught; this I call women's work. They are naturally more mannerly than we,

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"'You say, Harry,' interposed Mrs. Aikin, 'that it is women's work to teach manners to the children; but don't you think they learn them mostly from example?'

"'Certainly I do; manners as well as everything else. Man is called an imitative animal. You can tell by the actions of a child a year old what sort of people it has lived with. If parents are civil and kind to one another, if children never hear from them profane or coarse language, they will as naturally grow up well-behaved, as that candle took the form of the mould it was run in.'"

LESSONS IN GREEK.—No. LXI.

By J. R. Beard, D.D.

Syntax of the Prepositions.

The prepositions may be considered as originally adverbs of place, which, serving for the general description of local relations, had their force made more exact and definite by the aid of the several cases. The relations of space were easily transferred, first to time and then to the reciprocal relations of the qualities of objects; for all these relations are connected together as causes and consequences. Accordingly, the prepositions take to themselves certain cases, in order to mark or individualise the relations of place, of time, and of cause, the general notion of which is conveyed in the several forms of inflexion.

In the more ancient specimens of the language yet extant, several prepositions, *e.g.* *εν*, *επι*, and *περι*, are used as adverbs; and in the Attic *προς*, as in *προς δε*, retains this adverbial force. Prepositions have, too, an adverbial force when they stand in combination with verbs. Accordingly the preposition or adverb may be separated, and stand, as in English, apart from the verb. This separation bears the grammatical name of tmesis, or cutting.

Prepositions are commonly said to govern certain cases, as if prepositions determined the import of the cases; whereas it would be more correct to say that the cases define and limit the meaning of the prepositions.

Prepositions in connexion with an accusative show the direction, aim, and end of an action. In union with the dative, prepositions indicate duration in place or time, connexion and community, dependence and condition. In alliance with the genitive, prepositions denote a local and temporal direction from a certain point, distance from a source, the origin or means of an action.

By virtue of their essential signification, prepositions, in union with their cases, denote, some only one of the general ideas above indicated, others two, and others all the three. Accordingly, prepositions may be divided into such as are found with one case, such as are found with two cases, and such as are found with three cases.

Prepositions with One Case.

1. With the accusative: *εις* or *ες*, *into*, in, on, toward, against, at; *ανα*, *up* (denoting the higher point, while *επι* denotes the stopping point), over, yonder; *ὡς*, *to*, toward. In epic and lyric poetry *ανα* is connected also with the dative.
2. With the dative: *εν*, *in*; on, at, among; *συν*, sometimes written *ξυν*, *with* (denoting connexion and union).
3. With the genitive: *αντι*, *opposite*; over against, instead of, for; *απο* (Latin, ab), *from*; *εκ* or *εξ* (Latin, ex), *out of*; from, after; *προ*, *before*; for; *ανευ*, *without*; *ἑνεκα*, *on account of*; *χαριν*, *for the sake of*; *αχρι*, *up to*; *μεχρι*, *up to*.

Prepositions with Two Cases.

1. *δια*, with the genitive, *through* (of extent in space and time as well as of the means), in withdrawing or keeping apart; with the accusative, *on account of* (denoting the occasion), for the sake of.
2. *κατα*, with the genitive, *down* (the opposite of *ανα*) from, upon, against; with the accusative, *on*, at, near, by the side of, according to (Latin, secundum).
3. *μετα*, with the genitive, *with* (denoting community); with the accusative, *after* (Latin, post). The poets connect *μετα* also with the dative in the signification of among.
4. *ὑπερ*, with the genitive, *over*, for; with the accusative, *over*.

Prepositions with Three Cases.

1. *αμφι*, *around* (denoting presence on two sides); with the genitive, *around*, for the sake of; with the dative (only in the poets), *around* (in space), for the sake of; with the accusative, *around*, about (of time).
2. *περι*, *around* (denoting presence on all sides); with the genitive, used of surroundings in space, only by the poets; in prose it appears only with a causal import, *in regard to*, concerning (Latin, *de*), on account of; by, only in phrases, as *περι πολλου*, by much: often it is not represented by any English term, as *περι πλειστου ποιεῖσθαι*, to esteem very highly equivalent nearly to our "to make much of;" with the dative, *around* (of space), for the sake of, for; with the accusative, *around*, in respect of.
3. *επι*, *on* (denoting the point on which an object rests); with the genitive, of space, *on*, upon, in the point of support; of time, *during*. With the dative, when used of space, it has the same meaning as in connexion with the genitive, only that with the dative the object on which any thing supports itself, is conceived of as more concrete, more of a point, while extension is rather implied with the genitive. Moreover, *επι*, with the dative, denotes the object to which a predicate attaches itself; the object on which anything rests, in whose power anything is; the object with which another associates itself, or which another follows. Thus it means *to*, in addition to, besides, in behalf of, on condition of, in the power of; with the accusative, of space, *on*, denoting motion toward a resting place or point of support; in relation to (assigning the object), against; *towards* (assigning the aim or end), for, up to, after; to indicate extension in space and time, *over*, hence.
4. *παρα*, *by the side of*, with; with the genitive, *away from*; with the dative, *at*; with the accusative, *near*, along side, extending alongside, as two parallel lines do; in comparison with, together with, over against, against (hostilely), besides, beyond.
5. *προς*, denoting proximity, *near*; with the genitive, *on the side of*, on behalf of, for; with the dative, *at*; with the accusative, at, near, towards, in relation to.
6. *ὑπο*, *under*; with the genitive, of space, *under*, as in the power of; with a causal import, under the influence or operation of, by, from; with the dative, of space, *in*, *among*; to denote subordination, under; with the accusative, *under*, towards (intimating subordination, endeavour, attaining).

The primitive or fundamental meaning is in each case printed in italics. The secondary or derivative meanings are so many applications of the primitive or essential signification. The etymological deduction of the one from the other is not in all cases clear to the untrained eye, the rather because the relations of thought to each other and to time and place, were conceived of somewhat differently by the Greek to what they are by us. On a knowledge, however, of these and other particles, the shades of meaning in which are sometimes very delicate, depends, to no small extent, an exact acquaintance with the Greek language. Such a knowledge may be greatly promoted by a good lexicon, but can be fully obtained only by a minute and constant familiarity with the best Greek writers. In the summary just given, nothing more than the general outlines could be laid down. I may, however, subjoin a few remarks on some peculiarities in the Greek usage of the prepositions.

In regard to relations of space I must first say something. The place reached the Greeks often set forth as one where you find yourself, inasmuch as they view the result rather than the progress of a movement. Accordingly, verbs of motion are often construed with the dative in cases where the accusative would appear to be proper. This fact is exemplified with verbs signifying to place, to set, to lay, to bring to a place, to

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fall into something. If the place is mentioned, it appears in the dative with ἐν, though analogy would lead you to expect the accusative with εἰς. Consequently the Greeks said τίθεναι, καταπίθεναι ἐν νηΐ, ἐν ταφῳ; τίθεναι ἐν χερσιν; τίθεναι ἐν στήλῃ, to set on a pillar; τίθεναι ἐν τοις δικαιοις, to place among (or in the class of) the just; ἐν τοις φιλοσοφοις τίθεναι, to reckon among philosophers; so, βαλειν ἐνι ποντῳ, to cast into the sea; καθιζειν ἐν ἑδρᾳ, to place on a seat; δῆσαι ἐν δεσμῳ, to bind in chains. The preposition ἐπι, with the genitive or the dative, is sometimes used with these verbs; *e.g.* καθιζειν ἐπι θρονου, καταπίθεναι ἐπι τῆς γῆς, καταπιπτειν ἐπι γῆς; and in the poets, ἐπι γῃ πιπτειν, καταπιπτειν, τίθεναι ἐπι γουνασιν, ἐπι φρεσιν.

In English we often employ *in* where *into* would analogically seem required. Thus we say, "to fall in love;" "he took the book in his hand." By attention to the renderings of the prepositions in the examples just given, you will learn how impossible it is, consistently with the preservation of the English idiom, to adhere to one English representative, or, in other words, to limit yourself to one English meaning, of a Greek preposition. Ἐν denotes *in*, this is its fundamental signification; but above it is of necessity rendered on, among, and into; and, as found in τίθεναι ἐν νηΐ, would have to be translated *on board of*. You must ever bear in mind, that of the best one language is only an imperfect picture of another. You must also be told that you receive instruction in English to enable you not to turn Greek into English so much as to read English in Greek, or rather to read Greek in Greek. Then only will you thoroughly understand a language when you read its literature without any medium whatever.

To resume: With verbs which denote going to and arriving at a place, you will often find ἐπι with the genitive, in the poets with the dative, whereby it is intimated that in the writer's mind a tarrying at was consequent on the reaching of a place. Very common, therefore, are forms such as ἰεναι, ἀπιεναι, κομιζεσθαι, ἀναχωρεῖν, ἀποχωρεῖν, πλεῖν, ἀποπλεῖν, φευγειν ἐπ' οικου, ἐπ Ἀθηνῶν, ἐπι Σαλαμῖνος; and especially ἐπι, with the genitive used of names of cities and islands, as ἡ ἐπι Βαβυλῶνος ὁδος, etc.; so, poetically, ἱθυνειν ἱππους ἐπι τινι, ὁρμᾶσθαι ἐπ' ἀνδρασιν, ἐπ' ἀλληλοισιν ἰεναι, or ὀρουειν, and the like.

The place at which anything happens is sometimes represented by the Greeks as that towards which any one proceeds, the process rather than the result being prominent in the thoughts. This peculiarity is exemplified in παρεῖναι and παραγιγνεσθαι used with εἰς and an accusative, as παρεινα εἰς τινα τοπον, to be present at a certain place; παρεῖναι ἐπι το βῆμα, to ascend the speaking place (the rostrum (rostra?), or what in French is called *the tribune*); συλλεγεσθαι εἰς χωριον, to assemble at a place; συνελθειν εἰς ἐν or εἰς ταὐτον, to meet in one spot; ἀποβαινειν ἐς χωοιον, to land at a place.

With verbs which signify a spreading in space, the Greeks use εἰς, with an accusative. Such verbs are, διαδιδοναι, διασπειρειν, etc.; as διαδιδοναι εἰς την πολιν, to spread over the city.

The relation of movement or extension from a place is often used by the Greeks where in English we conceive of the relation implied in *at* or *on*, and consequently they employ ἐκ and ἀπο in such instances; as with verbs signifying to hang, to suspend, *e.g.* κρεμασθαι ἐκ τινος, to hang on something; κρεμαννυναι ἐκ τινος, to suspend from; ἀναπτειν ἐκ τινος, to attach to; also, ἀπο τινος, to bind to.

The same thing takes place with general indications of place, as ἐκ δεξιας, on the right hand; ἐξ ἀριστερας, on the left hand; ἐκ πλαγιου, on the flank; ἐκ του ἐναντιου, opposite, on the opposite side. If a local indication is enacted attributively to the subject or the object, and the verb is of that kind which denotes a removal from a place or an operation from a point, the Greeks employ the prepositions which correspond to that relation, namely, ἐκ and ἀπο (rarely παρα) with the genitive. In such cases we, in English, should use *in*, or *on*, or *at*: *e.g.*

οἱ ἐκ της πολιως ἐξῆλθον
those in the city went out.

τους ἐκ του τειχους στρατιωτας ἐξεβαλον
they drove out the soldiers who were in the castle

The proper place, as indeed the name (*pono*, before, and *pono*, I put) indicates, of the preposition, is immediately before the noun. There are, however, some deviations.

The preposition sometimes comes after the noun. This is very common in poetry. In prose the deviation is found chiefly with ἑνεκα; sometimes with περι, in connexion with the genitive, *e.g.* ἡμων ἑνεκα, on our account; τουτου ἑνεκα, on that account; σοφιας περι, concerning wisdom. Also ἀνευ stands after the relative pronoun in the genitive case, ὧν ἀνευ.

If the substantive to which the preposition belongs is accompanied by an attribute, the preposition is put between the two, frequently in poetry, rarely in prose; *e.g.* οὐδεν δι' ἀλλοι, on no other account; χρονον ἐπι πολυν, for a long time.

Between the preposition and its case, there are interposed connective or determinative particles, which cannot stand at the beginning of a sentence; such as μεν, δε, τε, οὖν, τοινυν, γαρ, γε, δη, *e.g.* ἐν μεν τῃ δημοκρατιᾳ, in the democracy; παρα δε τους ἀλλοις, with the rest; προς τε το μελλον, in regard to the future; ἐν γαρ εἰρηνῃ, in peace; κατα γε τα δυνατον, at least as far as possible; πολλῶν δη οὖν ἑνεκεν, for many reasons; ἀρετῆς οὖν περι, concerning virtue, then.

Other words also, which are used parenthetically, may be interposed between a preposition and its case; as οἱμαι, I think; and ὡς ἑπος εἰπεῖν, so to say; *e.g.* ἐν οἱμαι πολλοῖς, probably in many; παρα γαρ οἱμαι τους νομους, contrary to the laws, I think.

In the connection of several ideas, words depending on the same preposition require the preposition to be repeated before each, if there is a strong contrast between them, or if the preposition is used emphatically; but not otherwise.

ἀγυμναστως ἐχειν προς τε ψυχη και θαλπη
to be undisciplined for cold and heat.

The preposition is repeated with relatives, and with nouns in apposition, when the two members are expressly separated from each other; especially when the relative clause precedes the demonstrative: *e.g.*

οὐκ ἐστι συντομωτερα ὁδος περι ὧν αν βουλῃ δοκεῖν φρονιμος
there is not a more ready way than to be wise

εἶναι ἢ το γενεσθαι περι τουτων φρονιμον
in those things in which you wish to appear wise.

παρ' ἡμᾶς φοιτᾷ ὡς παρα φιλους
visit us as friends.

The prepositions give rise to a variety of idiomatic phrases, some of which I will subjoin, with English renderings.

Prepositional Peculiarities.

ανα πασαν ἡμιραν	every day
ανα κρατος	as much as possible
εἰς ᾅδου	to Hades
ἐν σοι ἐστιν	It depends on thee
αφ' ἑαυτοῦ χρησιμος εἰναι	to be useful in himself
ἐπλουτουν τινες ἐκ τοῦ πολεμου	some grew rich by the war
ἐκ του δικαιου	justly
κατ' ἐνιαυτον	every year
κατα δυναμιν	as well as you can
ἀι κατα το σῶμα ἐπιθυμιαι	corporeal desires
ἐπι τοῖς ἀρχουσι εἶναι	to be in the power of the governors
μετα του νομου	on the side of the law
παρα τους νομους	against the laws
παρ' οἶνον	at wine, over your cups
παρ' ἑκαστον	each by each, severally
προς αὐλον ὀρχεῖσθαι	to dance to the flute
προς τον καιρον	seasonably
προς μεσαμβριης	on the southern side
προς θεῶν και προς ἀνθρωπων	before gods and men
προς ἡμων εἶναι	to be for our advantage
προς θεων	by the gods, in the name of the gods
ὑπ' ἐυνοιας	from good-will
ὑπα του ὀφθαλμου	under the eye
παρα νυκτα	by night
παρα το ἀλγεινον	in comparison of what is painful
ἐπι τετταρων	four deep
ἐφ' ἑνος	one by one
εἰτ' ἐπι το βελτιον, εἰτ' ἐπι το χεῖρον	for better, for worse
περι παντων ἐμμεναι ἀλλων	to surpass all others
κατα της κεφαλης	down the head
δια στοματος ἐχειν	to speak about

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EXERCISES.—GREEK-ENGLISH.

Τα τῶν Αιγυπτιων πλοῖα ανα μιν τον ποταμον ου δυναται πλεῖν ην μη λαμπρος ανιμος επιχῃ, εκ γῆς δε παριλκεται. Οἱ πολεμιοι φευγουσιν ανα κρατος. Οἱ Περσαι διδασκουσι τους παιδας και σωφροσυνην· μεγα δε συμβαλλεται εις το μανθανειν σωφρονεῖν αυτους, ὁτι και τους πρεσβυτερους ὁρῶσιν ανα πᾶσαν ἡμεραν σωφρονας διαγοντας. Κλεαρχος, ὡςπερ εις αλλην τινα ἡδονην, ἡθελε δαπανᾶν εις πολεμον, αὐτω φιλοπολεμος ἡν. Κῦρος εξελαυνει επι τον Χαλον ποταμον· αἱ δε κῶμαι, εν αἰς εσκηνουν, Παρυσατιδος ἡσαν, εις ζωνην δεδομεναι. Ενιβαλλον εις την Αττικην στρατῳ μεγαλῳ Λακεδαιμονιοι μετα των συμμαχων, Αρχιδαμου τοῦ βασιλεως ἡγουμενου. Χωρια ψκουν ισχυρα οἱ Ταοχοι, εν οἰς και τα επιτηδεια παντα ἱλιχον. Κῦρος επαιδευθη εν Περσῶν νομοις. Τα εμον σῶμα, ὁταν τελευτησω, μητε εν χρυσῷ θῆτε, μητε εν αργυρῳ, μητε εν αλλῳ μηδενι, αλλα τῃ γῇ ὡς ταχιστα αποδοτε. Οἱ τριακοτα ἐβοηθουν τοις Ελευσινιοις ξυν τοῖς Λακωνικοῖς και ξυν τοις ἱππεῦσι. Πειρᾶσθαι χρη συν τοις θειοῖς αρχεσθαι παντος ἐργου. Δει τα βελτιστα αντι τῶν ἡδιων λαμβανειν. Εστρατευσαν οἱ Ἑλληνες επι βασιλεα ὡς ἑοῦλον αντι βασιλεως ποιησοντες. Τα μακρα τειχη ψκοδομησαν Αθηναῖοι Μεγαρεῦσι, τα απο της πολιος ες Νισαιαν. Οἱ εκ τῆς αγορᾶς ανθρωποι φευγουσιν. Κατεβησαν αἱ εκ τοῦ ὀρους. Το εξ Επιδαυρου τειχος ελικοῦσι. Οἱ εκ τῆς Ἑλλαδος τυραννοι κατελυθησαν. Οἱ εν τῶν νησων κακοῦργοι ανιστησαν. Αφικοντο προς αυτον τῶν παρα βασιλεως τινες. Οἱ Μηδοι ανεχωρησαν εκ τῆς Ευρωπης νικηθεντες και ναυσι και πεζῳ ὑπο Ἑλληνων. Εποει δενδρα πειρῶνται θεραπευειν τοῦ καρποῦ ἑνεκα. Κῦρος εμβαλων νικᾷ τους προ βασιλεως τεταγμενους. Ὁ Κῦρος εξελαυνει δια Συριας ες Μυριανδρον, πολιν οικουμενην ὑπο φοινικων επι τῇ θαλαττῃ. Οἱ βαρβαροι εκαιον πυρα πολλα δια νυκτος. Καλλισθενην ὁ δημος απεκτεινεν ου δια τας προς Περδικκαν ανοχας, αλλα δι' ἑτερας ἁμαρτιας. Το ὑδωρ κατα τας ταφρους ἐχωρει. Αἱ ἐχιδναι κατα πᾶσαν την γῆν εισι. Εσκηνουν οἱ Κυρου στρατιῶται κατα ταξεις. Οἱ Ἑλληνες εις τα πλοῖα τους τε ασθενοῦντας ενιβιβασαν και τους ὑπερ τετταρακοντα ετη. Ενιοι τῶν Περσῶν εἶχον και στρεπτους περι τοῖς τραχηλοις και ψελλια περι τοῖς χερσιν. Οἱ στρατιῶται, επει επι τας σκηνας απῆλθον, περι τα επιτηδεια ἡσαν. Σωκρατης το μητε περι Θεους ασεβῆσαι μητε περι ανθρωπους αδικος φανῆναι περι παντος εποιειτο. Κῦρος εξετασιν ποιεῖται των βαρβαρων εν τῷ πεδιῳ περι μεσας νυκτας. Κῦρος αναβας επι τον ἱππον τα παλτα εις τας χεῖρας ελαβε. Ὁπορταν βουλῃ τιμωνται ὡς εμε, επι σοι εσται. Οἱ Αθηναῖοι επλευσαν ναυσιν ἑξηκοντα επι Σαμον. Ου παρα μητρι σιτοῦνται οἱ των Περσων παῖδες, αλλα παρα τῳ διδασκαλῳ.

ENGLISH-GREEK.

The soldiers marched up the country. The soldiers marched down the hill. The soldiers marched over the mountains. The soldiers sat down alongside the walls. The soldiers marched from Athens to Marathon. The soldiers fought at Marathon. The soldiers fought bravely for their country. The soldiers fought against the enemy. The soldiers were drawn out in battle array. One soldier died for another. The soldiers had helmets on their heads. The soldiers sailed up the sea to Salamis. The soldiers sailed down the sea to Rome. The soldiers were instructed in the laws of their country. The soldiers, together with the allies, entered the city. The soldiers came out of the city, and were dispersed over the land.

LESSONS IN ITALIAN GRAMMAR.—No. L.

SYNTAX.—*Continued.*

OF NOUNS.

Rule 14.—When two nouns in English are united by the preposition of, *di* is used before the latter, if it requires no article; but if it does, it is preceded by *del, dello, della*.

Examples.

L'amore di Dio, the love of God	*Il valore dei Francesi*, the valour of the French
Il duomo di Firenze, the cathedral of Florence	*Il dente di giudizio spunta tardi*, the tooth of wisdom springs late
I flutti del mare, the waves of the sea	

Rule 15.—If, in English, a noun is in the possessive case, and followed by another noun, in Italian the former is placed after the latter, preceded by *di, del, dello, della*, or *dei*, etc.

Examples.

La chiesa di S. Paolo, Saint Paul's church	*La figlia del re*, the king's daughter
Il palazzo di S. Giacomo, Saint James's palace	*I guanti della moglie del maestro di casa del fratello del re*, the king's brother's steward's wife's gloves
Le leggi del Gran-Duca di Toscana, the Great Duke of Tuscany's laws	

Rule 16.—When two nouns are joined together in English, forming a compound noun, and showing the matter of which a thing is made, the preposition *di* is put between the two nouns.

Examples.

Vedo una casa di mattoni, I see a brick house	*E' un dio di legno*, it is a wooden god
Ecco la statua di marmo, behold the marble statue	*Datemi un orologio d'oro*, give me a gold watch

Ho perduto un anello di diamanti, I have lost a diamond ring.

OF ADJECTIVES.

Rule 17.—The Adjective, in Italian, agrees in gender and number with the substantive to which it refers.

Examples.

Il chirurgo del Signor Anna è stato un bravo uomo, Mr. Anne's surgeon has been an excellent man	*Io non feci parola di quella mia ridicola avventura*, I did not speak of my ridiculous adventure
Tutti i giorni non possono essere fecondi di brillanti avvenimenti, every day cannot produce brilliant events	*Dio ti benedica amorosa fanciulla!* God bless you, loving child!
	Oh che belle parabole! oh, what fine parables!

Rule 18.—Two or more substantives of different genders require the adjective in the plural masculine.

Examples.

Un uomo, e una donna piccoli, a little man and woman	brothers and sisters of the emperor were indisposed
Un ragazzo, e una ragazza cattivi, a naughty boy and girl	*Le mie case, ed i luoghi pubblichi di Roma son pieni d' antiche immagini de' miei maggiori*, my houses and the public places of Rome are filled with ancient statues of my ancestors
Il padre, e la madre sono caritatevoli, the father and mother are charitable	
I fratelli, e le sorelle dell' imperatore erano indisposti, the	

Rule 19.—When two or more adjectives refer to the same substantive, they may either precede or follow it.

Examples.

Avendo seco Tancredi varie e diverse novità pensate, Tancred having revolved in his mind different thoughts	*Una donna dotta e religiosa*, a learned and religious woman
Ed al nostro amore daremo piacevole, ed interno compimento, and we shall agreeably pass together all the time we can	*Un uomo sobrio, onesto, ed industrioso*, a sober, honest, and industrious man
	E' una damigella saggia, leggiadra, e graziosa, she is a wise, pretty, and graceful young lady

Rule 20.—When an adjective refers to several nouns of inanimate objects, without being separated by a verb, it agrees with the noun next to it.

Examples.

Rifiutano l'occasione d'acquistare onori, e gloria nuova, they refuse an opportunity of gaining new honours and glory	*Egli è d' una piacevolezza e d' un brio maraviglioso*, he is of uncommon gentleness and vivacity
Egli avea la mano e il cappello rosso, he had a red hand and hat	*E molti prieghi, e promesse grandissime mescolate, niuna cosa ottenne*, and though he used many entreaties and fair promises to persuade her, yet it was all in vain
Ecco l' affetto e la pietà materna, behold the maternal tenderness and piety	

Rule 21.—Italian adjectives are generally placed either before or after their substantives.

Examples.

Un nobile aspetto, or *un aspetto nobile*, a noble face	*La nuova sposa*, or *la sposa nuova*, (the new spouse) the bride
Un buon amico, or *un amico buono*, a good friend	*Il gran male*, the great evil
Un brutto negozio, or *un negozio brutto*, a bad affair	*Egli avesse la barba grande*, he had a (great) long beard

Rule 22.—Italian adjectives are placed after the nouns, when they express—

1. Nationality.

Un principe Italiano, an Italian prince	*La lingua Spagnuola*, the Spanish language
Una dama Francese, a French lady	*La politica Romana*, the Roman politics

La republica Americana, the American republic.

2. The shape or form.

Una tavola quadrata, a square table	*Una chiesa lunga*, a long church
Una forma ovale, an oval form	*Un sigillo rotondo*, a round seal
Un teatro largo, a wide theatre	

3. The state of the elements.

Un tempo freddo, cold weather	*Un aria salubre*, a wholesome air
Una terra arida, dry ground	*Un fuoco intenso*, an intense fire
Un vento caldo, a warm wind	

4. Colours.

Un abito turchino, a blue coat	*Un vino bianco*, a white wine
Una sedia indorata, a gilt chair	*Un fior giallo*, a yellow flower

Un occhio rosso, a red eye.

5. Taste.

Un frutto dolce, sweet fruit	*Un sidro agro*, sour cider
Un' erba amara, a bitter herb	*Un vino cotto*, burnt wine

Una pianta odorifera, an odoriferous plant.

The following adjectives have different meanings, according as they are placed before or after the substantive; as,

Una certa notizia, a certain piece of news	*Un gentiluomo*, a nobleman
Una notizia certa, a certain report	*Un uomo gentile*, a genteel man
Un galant' uomo, a brave and honest man	*Il pover uomo*, a man without genius
Un uomo galante, a gallant man	*E' un uomo povero*, he is a poor man

Rule 23.—The adjectives *bello, buono, santo*, lose their last syllable before masculine nouns beginning with a consonant; but *grande* loses it before masculine and feminine nouns.

Examples.

Singular.	*Plural.*
Bel giardino, fine garden	*Belli, bei, be' giardini*, fine gardens
Buon libro, good book	*Buoni libri*, good books
San Pietro, Saint Peter	*Santi Pietri*, Saint Peters
Bel ragazzo, fine boy	*Belli ragazzi*, fine boys
Gran birbone, great rascal	*Gran birboni*, great rascals
Gran regina, great queen	*Gran regine*, great queens

Rule 24.—The same adjectives, *bello, buono, grande, santo*, do not lose their last syllable before nouns beginning with an *s* followed by a consonant.

Examples

Singular.	*Plural.*
Bello sposo, fine husband	*Begli sposi*, fine husbands
Buono stato, good state	*Buoni stati*, good states
Grande strepito, great noise	*Grandi strepiti*, great noises
Grande spada, a long sword	*Grandi spade*, long swords
Santo Steffano, Saint Stephen	*Santi Steffani*, Saint Stephens

Rule 25.—The adjectives *bello, buono, grande, santo*, lose their final vowel before words beginning with a vowel, and take an apostrophe in its place.

Examples.

Bell' occhio, fine eye	*Sant' Antonio*, or *San' Antonio*, Saint Anthony
Buon' aspetto, good face	*Gran' ingegno*, great genius
Grand' impero, great empire	

Rule 26.—Adjectives of dimension, *alto*, high, *largo*, wide, *lungo*, long, *grosso*, thick, *profondo*, deep, do not require the preposition *di* before the numerals.

Examples.

Un tappeto lungo sei iardi e largo due, a carpet six yards long and two wide	*Un muro grosso due piedi*, a wall two feet thick
Questa fossa era profonda nove piedi, this ditch was nine feet deep	*Questa camera è alta sei piedi*, this room is six feet high
	Quell' albero è alto dieci piedi, this tree is ten feet high

COMPARATIVES AND SUPERLATIVES.

COMPARATIVES.

Rule 27.—When, in a comparison, "than" is followed by an article, or a possessive pronoun, it is expressed by the definite articles *del dello, della, degli, delle*.

Examples.

La rosa è più bella della viola, the rose is more beautiful than the violet	many is larger and more powerful than Italy
Il maestro è meno dotto dello scolare, the master is less learned than the scholar	*Questo libro è migliore del vostro*, this book is better than yours
La Germania è più grande, e più potente dell' Italia, Germany	*Questa camera è più bella della mia*, this room is prettier than mine

Rule 28.—When than is followed by an article, or a possessive pronoun, it is translated only by *di*.

Examples.

Cesare è stato più felice di Pompeo, Cæsar was more fortunate than Pompey	*Egli è più sciocco di voi*, he is more silly than you
Vostro padre è più dotto di me, your father is more learned than I	*Sono meno esperto di lui*, I am less experienced than he
	Giorgio è più astuto di Pietro, George is more cunning than Peter

Rule 29.—When a comparison is made between two adjectives, substantives, or adverbs, following one another, *than* is expressed by *che;* and, if there is a verb after *than*, this conjunction is rendered by *che non*.

Examples.

E più prudente che dotto, he is more prudent than learned	*E' meglio tardi che mai*, it is better late than never
Vostra zia ha più talento che grazia, your aunt has more talent than grace	*Spende più che non guadagna*, he spends more than he gains
	Io scrivo più che non parlo, I write more than I speak

Rule 30.—When "as much as," "so as," are employed in a comparison, they must be rendered by *quanto*.

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Examples.

Ho quanto danaro desidero, I have as much money as I desire
Egli è ricco quanto suo fratello, he is as rich as his brother
Siamo ingannati quanto voi, we are deceived as much as you
Eravamo afflitti quanto esso, we were as much grieved as he
Ella ha spirito quanto sua madre, she has as much wit as her mother

SUPERLATIVES.

Rule 31.—The relative or absolute superlatives are placed either before or after their substantives.

Examples.

Ella è la più bella donna d' Inghilterra, she is the finest woman in England
Vostro umilissimo servitore, your most humble servant
Ieri era un tempo freddissimo, yesterday was very cold weather
Ebenchè, potessino far le guerre più lunghe, and though they could carry on the longest wars
Egli è il più dotto precettore di Cambridge, he is the most learned instructor in Cambridge

OF NUMERALS.

THE CARDINAL NUMBERS.

Rule 32.—The Cardinal Numbers are placed either before or after their substantives.

Examples.

Il pranzo ci è costato cinque franchi per uno, our dinner has cost us five francs each
Egli giungerà in Parigi fra quindici giorni, he will arrive in Paris in a fortnight
E questo castello posto propinquo a Firenze, ad otto miglia, and his castle lies eight miles from Florence
Nel detta anno 1328, si commenciò, e fu due anni seguenti grande caro di grano, in Firenze, che di soldi 17 lo staio, il detto anno valse soldi 38, in the same year, 1328, there was such a scarcity of corn, which lasted for the two following years, that a bushel, which before was sold for 17 pence, was the same year sold for 38.
Cappetti centuno, calze trentuna, twenty-one hats, thirty-one stockings

THE ORDINAL NUMBERS.

Rule 33.—The Ordinal Numbers are placed before their nouns, and agree with them in gender and number, and take an article.

Examples.

Il quarto volume, the fourth volume
L'ottava meraviglia del mondo, the eighth wonder of the world
Il settimo angelo, the seventh angel
Il ventesimo sospiro, the twentieth sigh
Il decimoquarto secolo, the fourteenth century

Rule 34.—The ordinal numbers employed for quotations are generally put after their nouns, without an article,

Examples.

Storia d' Italia, libro settimo, the History of Italy, book the seventh
Giornata nona, novella ottava, the Ninth Day, noval the eighth
Storia d' America, epoca quinta, the History of America, fifth epoch
Nuova grammatica Italiana, capo decima, a New Italian Grammar, chapter the tenth
Il nana di una principessa, lettera seconda, the Dwarf of a Princess, letter the second

Rule 35.—The ordinal numbers are used without an article in speaking of emperors, kings, popes, and other dignitaries.

Examples.

Vita di Carlo duodecimo, Life of Charles the Twelfth
La cattività del pontefice Pio sesto, the captivity of the pontiff Pius the Sixth
Ferdinando quarto re di Napoli, Ferdinand the Fourth, king of Naples
Il secolo di Luigi decimoquarto, the age of Louis the Fourteenth
L' imperador Carlo quinto era sovrano delle Spagne, the emperor Charles the Fifth was sovereign of Spain

LESSONS IN SPANISH.—No. XX.

OF THE PASSIVE VERB.

THE passive verb is generally rendered in Spanish by *ser*, and always when the subject of the verb is acted upon by an agent, that is, when in English it would be accompanied with the prepositfon by; as,

Este discurso fué escrito por Diego, this discourse was written by James.

The passive verb must be rendered in Spanish by *estar* when the past participle is used adjectively, that is, when the subject of the verb does not seem so much to be acted upon by an agent as to have its state or condition described; as,

El discurso estuvo bien escrito, the discourse was well written.
El libro está corregido, the book is corrected.

The passive verb formed by *ser* is used in Spanish in the present and imperfect of the indicative mood, only when it is designed to express a mental act or a state of the emotions; as,

María es amada de Cárlos, Mary is loved by Charles.

When a mental act or a state of the emotions is not expressed, the passive verb, if it be used, must not be in the present or imperfect of the indicative mood: thus we cannot say, *el libro es escrito por un Español*, the book is written by a Spaniard, but, *el libro ha sido escrito por un Español*, the book has been written by a Spaniard.

When a mental act or state of the emotions is expressed, the prepositions *de* or *por* may be used after the passive verb before the agent; but when a mental act or state of the emotions is not expressed, *por* only can be used; as,

María es amada de (or *por*) *Cárlos*, Mary is beloved by Charles.
Todas las cosas fueron hechas por Dios, all things were made by God.

The reflective pronoun *se* is often used with verbs of the active voice, which are required to be rendered in English by the passive.

OF THE REGIMEN OF VERBS.

The object or regimen of the verb is either direct or indirect. The direct regimen is that on which the action immediately falls without the aid of any preposition; as,

Doy una pluma, I give a pen.

The indirect regimen is that on which the action of the verb cannot fall without the aid of a preposition; as,

Dijo á la muger, he said to the woman.

Sometimes both regimens are required after the verb; as,

Dió una pluma á' la muger, he gave a pen to the woman.

When the object of an active verb is a person or inanimate thing personified, it must be preceded by the preposition a',* as,

* This is a very important rule of Spanish syntax.

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Diego vió a la madre de Juan, James saw the mother of John
Dios recompensará á los buenos, God will-reward the good
El sol alumbra á la tierra, the sun enlightens the earth
La muger á quien vimos no es rica, the woman whom we saw is not rich
Vió á la que me dió dinero, he-saw her who gave me money

Sometimes the harmony of the sentence requires the *a'* to be suppressed, especially after the persons of the verb *tener*, to have, or to possess; as,

Tengo un hijo y tres hijas, I-have one son and three daughters.

One verb governs another in the infinitive mood; as,

Quieren imitarle, they-want to-imitate him.

Some verbs, as a general rule, require the preposition *a'* before the infinitive which they govern; such are those which mean, to attempt, to come, to go, to begin, to devote, to offer, to dare, to serve, to invite, to learn, to teach, to urge, to assist, to call, to advise, to submit, to prepare, to compel, to decide, to remain, and to accustom one's self; as,

Probó a' levantarse, he-attempted to raise himself.
Voy a' verla, I-am-going to see her.

Some verbs generally require the preposition *de* before the infinitive which they govern; such as those which mean, to cease, to be glad, to be ashamed, to resolve, to deprive, to fail, to finish, to abstain, to pity; as,

Dejó de estudiar, he-ceased to-study.
No faltaré de hacerlo, I-will-not fail to do it.

When the preposition "to" in English is used before the infinitive in the sense "in order to" (as, he labours to acquire fame, meaning, he labours in order to acquire fame), the preposition *para* is used in Spanish before the infinitive; as,

El hombre fué criado para aspirar a' la felicidad, man was created in-order-to aspire to felicity.

When the preposition "to" in English is used in the sense "for the sake of," the preposition *por* is used in Spanish before the infinitive; as,

Juan la dice, por decirle, John says it for-the-sake-of saying it.

Sometimes *que* precedes the infinitive instead of *por* or *para*; as,

Tiene algo que decirte, he-has something (which) to-tell thee.

The infinitive is often used without any preposition before it, especially when it is governed by verbs which mean, to be able, to permit, to wish, to endeavour, to make, to feign, to owe, to seem, to be wont, to know, to avail, to ace, to hear, to succeed, to hope, to be necessary, to think, to believe, to promise, to deign, to be the duty, to pretend, to judge, to prescribe, to require, to suffice; as,

No puede hacerlo, he-is not able to-do it.
Desco aprender, I-wish to-learn.

The infinitive in Spanish, when used as a present participle in English, may take any preposition before it; as,

Sintió la necesidad de ponerle en manos de la juventud, he-felt the necessity of-placing it in the hands of the youth.
Es constante en amarla, he-is constant in-loving her.

The verbs to see and to hear never govern the gerund in Spanish, but always the infinitive; thus we cannot say, *le vío viendo*, I-saw him coming, but *le vío venir*, I saw him come.

"To know how" is expressed in Spanish by "to know;" as,

Yo no sé nadar, I know not (how) to swim.

The infinitive, when governed by another verb in Spanish, is sometimes required to be rendered by another mood in English; as,

Piensa morir de alegría, he-thinks to-die (that he will die) of joy
Sabe deber su mérito á Dios solo, he-knows to-owe his merit (that his merit is owing) to God alone
Creo ver á mi padre, I-believe to-see (that I see) my father

When in English a reflective verb, or a verb implying command, governs an infinitive in the passive voice, in Spanish this infinitive must be in the active voice; as,

El rey se lo mandó dar, the king ordered it to-be-given to-him.
No te dejes vencer de lo mala, suffer not thyself to-be-overcome of evil.

The above examples literally would be rendered, "the king to-him it ordered to-give," and "not thyself suffer to overcome of that which is evil."

When a verb is governed by another in English, and can be rendered in another mood by using the conjunction "that," this latter mood should be employed in Spanish; thus, instead of saying, I think him to be learned, we can say, I think that he is (or may be) learned; and instead of, I requested him to go, we can say, I requested that he should go; which latter form of construction should generally be adopted in Spanish; as,

Espero que tendré el gusto de verle en breve, I-hope to have (the: I-shall-have) the pleasure of seeing him soon.

OF VERBS FOLLOWED BY CERTAIN PREPOSITIONS.

Verbs which signify to compare, to give, to yield, to resist, to concern, to belong, to refuse, to ask, generally require the preposition *á* before the noun to which the action of the verb passes over; as,

Ella se parece á su madre, she resembles her mother.
Demanda sabiduría al Señor, he asks wisdom from (to the) Lord.

Sometimes verbs having the sense, to remove or to take away, require the preposition *á* before the noun to which the action of the verb passes over; as,

Cain quitó la vida á su hermano Abel, Cain took-away the life of (to) his brother Abel.
Cortaron la cabeza á Saul, they-cut-off the head of (to) Saul.

Verbs denoting to be abundant, to lack, to be astonished, to blame, to repent, to pity, to make use, to absolve, to make sport, to remember, to forget, indirectly govern a noun by means of the preposition *de*; as,

Los valles abundan de trigo, the valleys abound with (of) wheat.
Los discípulos se asombraron de sus palabras, the disciples were astonished at (of) his words.
Llenaron la casa de perros, they-filled the house with (of) dogs.

Olvidar, to forget, is followed by *de* only when it is used as a reflective verb; as,

Olvidarse de lo pasada,* to-forget the past.
Olvidar su nombre, to-forget his name.

The verb *ser*, when used to imply property or possession, requires the noun denoting the possessor to be preceded by the preposition *de*; as,

El libro es de mi padre, the book belongs to (is of) my father.

De generally precedes nouns which denote the causes of which the verb explains the effect; as,

Tiembla de miedo, he-trembles with (from) fear.
Tirita de frío, he-shivers with (of) cold
Sus ojos se bañaron de lágrimas, his eyes were wet with (of) tears.

* Literally, to-forget oneself of the past.

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When a noun refers to the instrument with which the action of the verb is effected, it requires the preposition *con* before it; when the noun is the name of the blow and the object with which it is effected, it requires the preposition *de* or *con* before it, when it is employed in the singular number, and the preposition *á* when employed in the plural; as,

Los soldados le mataron con un dardo, the soldiers killed him with a dart. | *Ellos le mataron de* (or *con*) *una dardada*, they slew him with a blow-of-a-dart.

Le mataron á dardadas, they slew him by blows-of-a-dart.

Sometimes the preposition *a'* is found preceding the name of the instrument in the singular; as,

Quien a' hierro mata, a' hierro muere, he who with steel* kills, by steel dies.

When the reflective verb *meterse* is used to signify, to meddle, to interfere, it requires the preposition *con* before the noun to which it refers as its object, if such noun be the name of a person, and *en* if it be the name of anything inanimate; as,

No te metas con estas detractores, meddle not thyself with these slanderers. | *No te metas en los negócios agenos*, meddle not thyself in the affairs of-others.

The preposition *a'* (to) should not be used in Spanish when we speak of motion merely directed towards a place, but *hácia* and *para*; as,

Está caminando hácia Tolosa, he-is journeying towards Tolosa. | *Mi padre salió para Madrid*, my father set-out for Madrid.

Gerunds require the same prepositions as the verbs from which they are derived; as,

Acordándose de sus obras, remembering his works.

OF THE USE OF THE VERBS SER AND ESTAR.

The different parts of the verbs *ser* and *estar* are generally to be rendered in English alike; but in Spanish these verbs are not used indiscriminately for each other. Each predicates the existence of some property or quality in an object; but *ser* predicates absolute, and *estar* a relative existence. When the property or quality is essential, natural, or inherent in the object, *ser* is to be used. When the quality is not natural (that is, not produced by nature), or when it is expressive of a transient state, *estar* is to be used. *Ser*, then, is used to affirm what a thing is naturally or by nature, or to express any permanent state or characteristic quality or property of an object; while *estar* is used to affirm how a thing exists at any period of time, or where anything is or exists. *Ser* affirms what a thing is; *estar* expresses how or where a thing is. Thus, *el cuarto es espacioso*, the room is spacious; with *ser*, because it tells what the room is; and *el cuarto está limpio*, the room is clean; with *estar*, because it tells how the room is. *Juan está en el campo*, John is in the country; with *estar*, because it tells where John is. "Mary is beautiful," affirms what Mary is; "Mary is glad," affirms how Mary is: and of course *es* would be used in the former sentence, and *está* in the latter. "Peter is sick," affirms how or in what state Peter exists at a certain period of time, and *estar* must be used; thus, *Pedro está enfermo*; but "Peter is sickly" expresses what Peter is, namely, of a sickly or unhealthy constitution, and *ser* must be used; thus, *Pedro es enfermizo*.

In Spanish it may be said, *Cárlos es ciego*, or *Cárlos está ciego*, and each sentence would be rendered in English, "Charles is blind." But in Spanish, the former would mean that Charles is blind by nature, or permanently blind; and the latter that Charles is in a state of blindness for the time being only, which might be the case from temporary illness, or from dust thrown into his eyes. *Esta muger es loca* means, this woman is insane, that is, permanently destitute of reason; and *esta muger está loca* means, this woman is frantic; that is, in a temporary fit or phrenzy, acting like a madman. In this latter case, *está* might be rendered "seems" or "appears," as, this woman seems (or acts like one) mad. So of a man of a generous disposition, it would be said, he is (*es*) generous; but of a notorious miser, who might happen on a certain occasion to exhibit a little generosity, it would be said, he is (*está*) generous; that is, he shows himself generous for the time being, though generosity is no real trait in his character. *María es jóven*, means Mary is young, that is, Mary is a young woman; youthfulness being at her period of life a natural (though not permanent) state. We can also say, *el viejo está jóven*, the old-man is young, that is, the old-man seems young, has a youthful appearance, or acts like a youth; *estar* being used because youthfulness is not natural to his years.

The right manner of using the verbs *ser* and *estar* being of great importance, and yet attended with some difficulty to students, we will give a few more explicit rules, the substance of all, however, being contained in the foregoing remarks.

Ser is used to affirm the existence of essential, natural, permanent, or characteristic states or qualities of the mind, persons or things, and to affirm what, or of what a person or thing is, was, or will be; as,

El yelo es frio, ice is cold.
El plomo es pesado, lead is heavy.
Juan es bueno y sábio, John is good and wise.
Soy sobérbio, I-am proud.
Lóndres no es pequeña, London is not small.
La miel es dulce, honey is sweet.
El hombre es polvo, man is dust.
Vmd. es rico, you are rich.
Es tarde, it is late.
Perdonar las injúrias es obrar como Cristianos, to-forgive injuries is to act like Christians.
Pedro era capitan, ahora es mayor, y será coronel, Peter was captain, now is major, and will-be colonel.

The natural beauties of the body, and its defects when regarded as permanent, are affirmed with *ser*; as,

Lucía es hermosa, Lucy is beautiful. | *Ella es corcobada y ciega*,† she is hump-backed and blind.

The materials of which anything is made are affirmed by *ser*; also the possession or destination of anything; as,

La taza es de oro, the cup is of gold.
La mesa es de cedro, the table is of cedar.
La corona es de la reina, the crown is the queen's.
El libro es mio, the book is mine.
Es de dia, it-is day.
Es de noche, it-is night.
Cervántes es de Alcalá, Cervantes is from Alcala.
Este vino es de España, this wine is from Spain.
Esta flor es para María, this flower is for Mary.
La carta era para él, the letter was for him.

Estar is used to affirm the temporary, non-natural, accidental, or contingent condition or location of persons or things, transient emotions of the mind; that is, to affirm how or where a thing exists, existed, or will exist, at any period of time; as,

Estoy alegre, I-am merry.
Está enfadado, he-is angry.
Yo estaba ciego,† I-was blind.
El tiempo estará nublado, the weather will be cloudy.
El mar está airado, the sea is raging.

The physical changes, and state of the health of the animal body, as also the chemical and mechanical changes of substances, are affirmed by *estar*; as,

Ella está enferma, she is unwell.
Estoy bueno, I-am well.
Yo estaba cojo, I-was lame.
La leche está ágria, the milk is sour.
El agua está caliente, the water is hot.
Vmd. está despierto, you are awake.
La carne estaba asada, the meat was roasted.

* Literally, iron, meaning the sword.

† That is, permanently blind.
† That is, transiently blind.

In affirming any manner, situation, position, or location of persons or things, *estar* is used; as,

Juan está de moda, John is in the fashion.
Está de rodillas, he-is on (his) knees.
Estoy de prisa, I-am in haste.
Estoy de tu parecer, I-am of thy opinion.
Clara está en la iglesia, Clara is in the church.
Estaba en la calle, he-was in the street.
Estan á la puerta, they-are at the door.
La comida está en la mesa, the dinner is on the table.
¿ Donde está mi padre? where is my father?
Está en la cama, he-is in bed.
Estas quisantes ya están en flor, these peas are already in blossom.
Está entre dos soldados, he-is between two soldiers.
Estaba en Paris, he-was in Paris.

Estar (and not *ser*) is always employed before the gerund, since this serves to show the manner of being occupied; as,

Jorge está silbando, George is whistling.
Ella estará regañando, she will-be scolding.
Ellos están leyendo, they are reading.
Estoy escribiendo, I-am writing.

Estar is sometimes used with a preposition to form a particular idiomatic phrase; thus *estar sin* means, to be destitute of; *estar á*, to understand; *estar en*, to be resolved on, to know.

Ser and *estar* may sometimes be used with the same adjective, but in such cases the meaning of the adjective cannot remain the same, since *ser* affirms what a person or thing is, and *estar* affirms how it is for the time being; as,

Es bueno, he-is good.
Está bueno, he-is well.
Es malo, he-is wicked.
Está malo, he-is ill.
Es callada, he-is taciturn.
Está callado, he-is silent.
Es cansado, he-is tiresome.
Está cansado, he-is tired.
Es vivo, he-is lively.
Está vivo, he-is alive.
Esta naranja es agria, this orange is sour (of a sour kind).
Esta naranja está agria, this orange is sour (unripe).

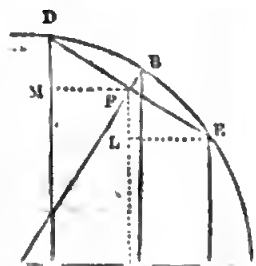
The manner of using *ser* and *estar* in forming the passive voice, has already been explained.

LESSONS IN TRIGONOMETRY.—No. III.

TRIGONOMETRICAL FORMULÆ.

1. *Expressions for the sine and cosine of the sum and difference of two arcs.*

Let AB and BD represent any two given arcs; take BH equal to BD; it is required to find an expression for the sine of AD, the sum, and of AH, the difference of these arcs.



Put AB $= a$, and BD $= b$; then AD $= a + b$, and AH $= a - b$. Draw the chord DH, and the radius OB, which may be represented by R. Since DB is by construction equal to DH, DF is equal to FH, and therefore DH is perpendicular to CB. Let fall the perpendiculars HO, BN, FI and DK upon AC, and draw HL, FM parallel to AC.

Because the triangles BCN, FCI are similar, we have,

CB : CF :: BN : FI; or, R : cos. b :: sin. a : FI,

Therefore, $$FI = \frac{\sin. a \cos. b}{R}.$$

Also, CB : CF :: CN : CI; or, R : cos. b :: cos. a : CI.

Therefore, $$CI = \frac{\cos. a \cos. b}{R}.$$

The triangles DFM, DBH, having their sides perpendicular each to each, are similar, and give the proportions,

CB : DF :: CH : DM; or, R : sin. b :: cos. a : DM.

Hence, $$DM = \frac{\cos. a \sin. b}{R}.$$

Also, CB : DF :: BH : FM; or, R : sin. b :: sin. a : FM.

Hence, $$FM = \frac{\sin. a \sin. b}{R}.$$

But, $FI + DM = DK = \sin. (a + b)$;
and $CI - FM = CK = \cos. (a + b)$.
Also, $FI - FL = BG = \sin. (a - b)$;
and $CI + BL = CO = \cos. (a - b)$.

Hence, $$\sin. (a + b) = \frac{\sin. a \cos. b + \sin. b \cos. a}{R} \quad (1)$$

$$\cos. (a + b) = \frac{\cos. a \cos. b - \sin. a \sin. b}{R} \quad (2)$$

$$\sin. (a - b) = \frac{\sin. a \cos. b - \sin. b \cos. a}{R} \quad (3)$$

$$\cos. (a - b) = \frac{\cos. a \cos. b + \sin. a \sin. b}{R} \quad (4)$$

2. *Expressions for the sine and cosine of a double arc.*

If, in the formulas of the preceding article, we make $b = a$, the first and second will become,

$$\sin. 2a = \frac{2 \sin. a \cos. a}{R},$$

$$\cos. 2a = \frac{\cos.^2 a - \sin.^2 a}{R}.$$

3. *Expressions for the sine and cosine of half a given arc.*

If we put $\frac{1}{2}a$ for a in the preceding equations, we obtain,

$$\sin. a = \frac{2 \sin. \frac{1}{2}a \cos. \frac{1}{2}a}{R},$$

$$\cos. a = \frac{\cos.^2 \frac{1}{2}a - \sin.^2 \frac{1}{2}a}{R}.$$

We may also find the sine and cosine of $\frac{1}{2}a$ in terms of a.

Since the sum of the squares of the sine and cosine is equal to the square of radius, we have,

$$\cos.^2 \tfrac{1}{2}a + \sin.^2 \tfrac{1}{2}a = R^2.$$

And, from the preceding equation,

$$\cos.^2 \tfrac{1}{2}a - \sin.^2 \tfrac{1}{2}a = R \cos. a.$$

If we subtract one of these from the other, we have,

$$2 \sin.^2 \tfrac{1}{2}a = R^2 - R \cos. a.$$

And adding the same equations,

$$2 \cos.^2 \tfrac{1}{2}a = R^2 + R \cos. a.$$

Hence, $$\sin. \tfrac{1}{2}a = \sqrt{\tfrac{1}{2}R^2 - \tfrac{1}{2}R \cos. a};$$
$$\cos. \tfrac{1}{2}a = \sqrt{\tfrac{1}{2}R^2 + \tfrac{1}{2}R \cos. a}.$$

4. *Expressions for the products of sines and cosines.*

By adding and subtracting the formulas of Art. I, we obtain,

$$\sin. (a + b) + \sin. (a - b) = \frac{2}{R} \sin. a \cos. b;$$

$$\sin. (a + b) - \sin. (a - b) = \frac{2}{R} \sin. b \cos. a;$$

$$\cos. (a + b) + \cos. (a - b) = \frac{2}{R} \cos. a \cos. b;$$

$$\cos. (a - b) - \cos. (a + b) = \frac{2}{R} \sin. a \sin. b;$$

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If, in these formulas, we make $a + b = A$, and $a - b = B$; that is, $a = \frac{1}{2}(A + B)$, and $b = \frac{1}{2}(A - B)$, we shall have,

$$\text{sin. } A + \text{sin. } B = \frac{2}{R} \text{ sin. } \tfrac{1}{2}(A + B) \text{ cos. } \tfrac{1}{2}(A - B) \quad (1)$$

$$\text{sin. } A - \text{sin. } B = \frac{2}{R} \text{ sin. } \tfrac{1}{2}(A - B) \text{ cos. } \tfrac{1}{2}(A + B) \quad (2)$$

$$\text{cos. } A + \text{cos. } B = \frac{2}{R} \text{ cos. } \tfrac{1}{2}(A + B) \text{ cos. } \tfrac{1}{2}(A - B) \quad (3)$$

$$\text{cos. } B - \text{cos. } A = \frac{2}{R} \text{ sin. } \tfrac{1}{2}(A + B) \text{ sin. } \tfrac{1}{2}(A - B) \quad (4)$$

Dividing formula (1) by (2), and considering that $\frac{\text{sin. } a}{\text{cos. } a} = \frac{R}{\text{tang. } a}$, we have,

$$\frac{\text{sin. } A + \text{sin. } B}{\text{sin. } A - \text{sin. } B} = \frac{\text{sin. } \frac{1}{2}(A+B) \text{ cos. } \frac{1}{2}(A-B)}{\text{sin. } \frac{1}{2}(A-B) \text{ cos. } \frac{1}{2}(A+B)} = \frac{\text{tang. } \frac{1}{2}(A+B)}{\text{tang. } \frac{1}{2}(A-B)};$$

that is,

The sum of the sines of two arcs is to their difference as the tangent of half the sum of those arcs is to the tangent of half their difference.

Dividing formula (3) by (4), and considering that $\frac{\text{cos.}}{\text{sin.}} = \frac{\text{cot.}}{R} = \frac{R}{\text{tang.}}$, we have,

$$\frac{\text{cos. } A + \text{cos. } B}{\text{cos. } B - \text{cos. } A} = \frac{\text{cos. } \frac{1}{2}(A+B) \text{ cos. } \frac{1}{2}(A-B)}{\text{sin. } \frac{1}{2}(A+B) \text{ sin. } \frac{1}{2}(A-B)} = \frac{\text{cot. } \frac{1}{2}(A+B)}{\text{tang. } \frac{1}{2}(A-B)};$$

that is,

The sum of the cosines of two arcs is to their difference as the cotangent of half the sum of those arcs is to the tangent of half their difference.

5. *Expressions for the tangents of arcs.*

If we take the expression $\text{tang. } (a + b) = \frac{R \text{ sin. } (a + b)}{\text{cos. } (a + b)}$, and substitute for sin. $(a + b)$ and cos. $(a + b)$ their values given in Art. 1, we shall find,

$$\text{tang. } (a + b) = \frac{R \text{ (sin. } a \text{ cos. } b + \text{sin. } b \text{ cos. } a}{\text{cos. } a \text{ cos. } b - \text{sin. } a \text{ sin. } b}.$$

But $\text{sin } a = \frac{\text{cos. } a \text{ tang. } a}{R}$, and $\text{sin. } b = \frac{\text{cos. } b \text{ tang. } b}{R}$.

If we substitute these values in the preceding equation, and divide all the terms by cos. a cos. b, we shall have,

$$\text{tang. } (a + b) = \frac{R^2 \text{ (tang. } a + \text{tang. } b)}{R^2 - \text{tang. } a \text{ tang. } b}$$

In like manner, we shall find,

$$\text{tang. } (a - b) = \frac{R^2 \text{ (tang. } a - \text{tang. } b)}{R^2 + \text{tang. } a \text{ tang. } b}.$$

Suppose $b = a$, then,

$$\text{tang. } 2a = \frac{2R^2 \text{ tang. } a}{R^2 - \text{tang.}^2 a}.$$

Suppose $b = 2a$, then,

$$\text{tang. } 3a = \frac{R^2 \text{ (tang. } a + \text{tang. } 2a)}{R^2 - \text{tang. } a \text{ tang. } 2a}$$

In the same manner we find,

$$\text{cot. } (a + b) = \frac{\text{cot. } a \text{ cot. } b - R^2}{\text{cot. } b + \text{cot. } a},$$

$$\text{cot. } (a - b) = \frac{\text{cot. } a \text{ cot. } b + R^2}{\text{cot. } b - \text{cot. } a}.$$

6. When the three sides of a triangle are given, the angles may be found by the formula,

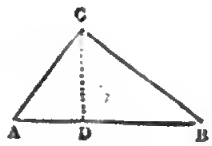
$$\text{sin. } \tfrac{1}{2}A = R \sqrt{\frac{(s - b)(s - c)}{bs}}.$$

Demonstration.

Let A B C be any triangle; then,

$$BC^2 = AB^2 + AC^2 - 2AB \times AD.$$

Hence, $AD = \frac{AB^2 + AC^2 - BC^2}{2AB}$



But in the right-angled triangle A C D, we have,

$$B : AC :: \text{cos. } A : AD.$$

Hence, $\text{cos. } A = \frac{R \times AD}{AC}$;

or, by substituting the value of A D,

$$\text{cos. } A = R \times \frac{AB^2 + AC^2 - BC^2}{2AB \times AC}.$$

Let a b c represent the sides opposite the angles A B C; then, $\text{cos. } A = R \times \frac{b^2 + c^2 - a^2}{2bc}$.

By Art. 3, we have, $2 \text{ sin.}^2 \frac{1}{2}A = R^2 - R \text{ cos } A$.
Substituting for cos. A its value given above, we obtain,

$$2 \text{ sin.}^2 \tfrac{1}{2}A = R^2 - R^2 \times \frac{b^2 + c^2 - a^2}{2bc} = R^2 \times \frac{2bc + a^2 - b^2 - c^2}{2bc}$$

$$= \frac{R^2 \times (a + b - c)(a + c - b)}{2bc}.$$

Put $s = \frac{1}{2}(a + b + c)$, and we obtain,

$$\text{sin. } \tfrac{1}{2}A = R \sqrt{\frac{(s - b)(s - c)}{bc}}.$$

Ex. 1. What are the angles of a plane triangle whose sides are 432, 543 and 654?

Here $s = 814{\cdot}5$; $s - b = 382{\cdot}5$; $s - c = 271{\cdot}5$.

log. 382·5	2·582631
log. 271·5	2·433770
log. b, 432	comp. 7·364516
log. c, 543	comp. 7·265200
	2)19·646117
sin. $\frac{1}{2}A$, 41° 42′ 36½″	9·823058.

Angle A = 83° 25′ 13″.

In a similar manner we find the angle B = 41° 0′ 39″, and the angle C = 55° 34′ 8″.

Ex. 2. What are the angles of a plane triangle whose sides are 245, 219 and 91?

7. *On the computation of a table of sines, cosines, etc.*

In computing a table of sines and cosines, we begin with finding the sine and cosine of *one minute*, and thence deduce the sines and cosines of larger arcs. The sine of so small an angle as one minute is nearly equal to the corresponding arc. The radius being taken as unity, the semicircumference is known to be 3·14159. This being divided successively by 180

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and 60. gives 0002908882 for the arc of one minute, which may be regarded as the sine of one minute.

$$\text{The cosine of } 1' = \sqrt{1 - \sin.^2} = 0{\cdot}9999999577.$$

The sines of very small angles are nearly proportional to the angles themselves. We might then obtain several other sines by direct proportion. This method will give the sines correct to five decimal places as far as two degrees. By the following method they may be obtained with greater accuracy for the entire quadrant.

By Art. 4, we have, by transposition,

$$\sin.(a+b) = 2\sin.a\cos.b - \sin.(a-b),$$
$$\cos.(a+b) = 2\cos.a\cos.b - \cos.(a-b).$$

If we put $b = 1'$, and $a = 1', 2', 3'$, etc., successively, we shall have,

$$\sin.2' = 2\sin.1'\cos.1 - \sin.0' = \cdot000582,$$
$$\sin.3' = 2\sin.2'\cos.1 - \sin.1' = \cdot000873,$$
$$\sin.4' = 2\sin.3'\cos.1 - \sin.2' = \cdot001164,$$
etc. etc.

$$\cos.2' = 2\cos.1'\cos.1' - \cos.0' = 0{\cdot}999999,$$
$$\cos.3' = 2\cos.2'\cos.1 - \cos.1 = 0{\cdot}999999,$$
$$\cos.4' = 2\cos.3'\cos.1' - \cos.2' = 0{\cdot}999999,$$
etc. etc.

The tangents, cotangents, secants and cosecants are easily derived from the sines and cosines. Thus,

$$\text{tang. } 1' = \frac{\sin.1'}{\cos.1'} \qquad \text{cot. } 1' = \frac{\cos.1'}{\sin.1'},$$

$$\text{sec. } 1' = \frac{1}{\cos.1'}, \qquad \text{cosec. } 1' = \frac{1}{\sin.1'},$$

etc. etc.

THEORY AND PRACTICE OF TEACHING.
No. V.

DRAWING-OUT PROCESS.

This consists in asking what the lawyers call *leading questions*. It is practised, usually, whenever the teacher desires to help along the pupil. "John," says the teacher when conducting a recitation in Long Division, "John, what is the number to be divided called?" John hesitates. "Is it the dividend?" says the teacher. "Yes, sir—the dividend." "Well, John, what is that which is left after dividing called? — the remainder — is it?" "Yes, sir." A visitor now enters the room, and the teacher desires to show off John's talents. "Well, John, of what denomination is the remainder?"

John looks upon the floor.

"Isn't it always the same as the dividend, John?"

"Yes, sir."

"Very well, John," says the teacher, soothingly, "what denomination is this dividend?" pointing to the work upon the board. "Shillings, is it not?"

"Yes, sir; shillings."

"Very well; now what is this remainder?"

John hesitates.

"Why *shillings* too, isn't it?" says the teacher.

"Oh yes, sir, *shillings!*" says John, energetically, while the teacher complacently looks at the visitor to see if he has noticed how *correctly* John has answered!

We may further illustrate this *drawing-out* process, by describing an occurrence which, in company with a friend, we once witnessed. A teacher whose school we visited called upon a class in Colburn's First Lessons. They rose, and in single file marched to the usual place, with their books in hand, and stood erect. It was a very good-looking class.

"Where do you begin?" said the teacher, taking the book.

Pupils. On the 80th page, 3rd question.

Teacher. Read it, Charles.

Charles. (Reads.) "A man being asked how many sheep he had, said that he had them in two pastures; in one pasture he had eight; that three-fourths of these were just one-third of what he had in the other. How many were there in the other?"

Teacher. Well, Charles, you must first get one-fourth of eight, must you not?

Charles. Yes, sir.

Teacher. Well, one-fourth of eight is two, isn't it?

Charles. Yes, sir; one-fourth of eight is two.

Teacher. Well, then, three-fourths will be three times two, won't it?

Charles. Yes, sir.

Teacher. Well, three times two are six, eh?

Charles. Yes, sir.

Teacher. Very well. (A pause.) Now the book says that this six is just one-third of what he had in the other pasture, don't it?

Charles. Yes, sir.

Teacher. Then if six is one-third, three-thirds will be—three times six, won't it?

Charles. Yes, sir.

Teacher. And three times six are—eighteen, ain't it?

Charles. Yes, sir!

Teacher. Then he had eighteen sheep in the other pasture, had he?

Charles. Yes, sir!

Teacher. Next, take the next one.

At this point we interposed, and asked the teacher if he would request Charles to go through it alone. "Oh, yes," said the teacher, "Charles, you may do it again." Charles again read the question, and—looked up. "Well," said the teacher, "you must first get one-fourth of eight, musn't you?" "Yes, sir." "And one-fourth of eight is two, isn't it?" "Yes, sir." And so the process went on as before, till the final eighteen sheep were *drawn out* as before. The teacher now looked round, with an air which seemed to say, "Now I suppose you are satisfied."

"Shall we ask Charles to do it again?" said we. The teacher assented. Charles again read the question, and again —looked up. We waited, and he waited;—but the teacher could *not* wait. "Why, Charles," said he impatiently; "you want one-fourth of eight, don't you?" "Yes, sir," said Charles, promptly; and we thought best not to insist further at this time upon a repetition of "*yes, sir,*" and the class were allowed to proceed in their own way.

This is, indeed, an extreme case, and yet it is but a fair sample of that teacher's method of stupefying mind. This habit of assisting the pupil to some extent, is, however, a very common one, and as deleterious to mind as it is common. The teacher should at once abandon this practice, and require the scholar *to do the talking* at recitation. We need hardly suggest that such a course of *extraction* at recitation, aside from the waste of time by both parties, and the waste of strength by the teacher, has a direct tendency to make the scholar miserably superficial. For why should he study, if he knows from constant experience that the teacher, by a leading question, will relieve him from all embarrassment? It has often been remarked, that "the teacher makes the school." Perhaps in no way can he more effectually make an inefficient school than by this *drawing-out process.*

We look upon the two processes just described as very prominent and prevalent faults in our modern teaching; and if by describing them thus fully, we shall induce any to set a guard upon their practice in this particular, we shall feel amply rewarded.

THE MORE EXCELLENT WAY

It is always a very difficult question for the teacher to settle, "How far shall I help the pupil, and how far shall the pupil be required to help himself?" The teaching of nature would seem to indicate that the pupil should be taught mainly to depend on his own resources. This, too, we think is the teaching of common sense. Whatever is learned should be so thoroughly learned, that the next and higher step may be comparatively easy. And the teacher should always inquire, when he is about to dismiss one subject, whether the class understand it so well that they can go on to the next. He may, indeed, sometimes give a word of suggestion during the preparation of a lesson and by a seasonable hint, save the

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scholar the needless loss of much time. But it is a very great evil if the pupils acquire the habit of running to the teacher as soon as a slight difficulty presents itself, to request him to remove it. Some teachers, when this happens, will send the scholar to his seat with a reproof perhaps, while others, with a mistaken kindness, will answer the question or solve the problem themselves, as the shortest way to get rid of it. Both these courses are in general wrong. The inquirer should never be frowned upon; this may discourage him. He should not be relieved from labour, as this will diminish his self-reliance without enlightening him; for whatever is done *for* a scholar without his having studied closely upon it himself, makes but a feeble impression upon him, and is soon forgotten. The true way is, neither to discourage inquiry nor answer the question. Converse with the scholar a little as to the principles involved in the question; refer him to principles which he has before learned, or has now lost sight of; perhaps call his attention to some rule or explanation before given to the class; go just so far as to enlighten him a little, and *put him on the scent*, then leave him to achieve the victory himself. There is a great satisfaction in discovering a difficult thing for one's self,—and the teacher does the scholar a lasting injury who takes this pleasure from him. The teacher should be simply suggestive, but should never take the glory of a victory from the scholar by doing his work for him,—at least, not until he has given it a thorough trial himself.

The skill of the teacher, then, will be best manifested, if he can contrive to awaken such a spirit in the pupil that he shall be very unwilling to be assisted; if he can kindle up such a zeal, that the pupil will prefer to try again and again before he will consent that the teacher shall interpose. We shall never forget a class of boys, some fourteen or fifteen years of age, who in the study of algebra had imbibed this spirit. A difficult question had been before the class a day or two, when we suggested giving them some assistance. "*Not to-day, sir,*" was the spontaneous exclamation of nearly every one. Nor shall we forget the expression that beamed from the countenance of one of them, when, elated with his success, he forgot the proprieties of the school and audibly exclaimed, "*I've got it! I've got it!*" It was a great day for him; he felt, as he never before had felt, his own might. Nor was it less gratifying to us to find that his fellows were still unwilling to know his method of solution. The next day a large number brought a solution of their own, each showing evidence of originality. A class that has once attained to a feeling like this, will go on to educate themselves when they shall have left the school and the living teacher.

As to the communication of knowledge, aside from that immediately connected with school-studies, there is a more excellent way than that *of pouring it in* by the process already described. It is but just that we should give a specimen of the method of doing this. We shall now proceed to do so under the head of

WAKING UP MIND.

The teacher of any experience knows, that if he will excite a deep and profitable interest in his school, he must teach many things besides *book-studies*. In our common schools there will always be a company of small children, who, not yet having learned to read understandingly, will have no means of interesting themselves, and must depend mainly upon the teacher for the interest they take in the school. This to them is perhaps the most critical period of their lives. Whatever impression is now made upon them will be enduring. If they become disgusted with the dullness and confinement of school, and associate the idea of pain and repulsiveness with that of learning, who can describe the injury done to their minds? If, on the other hand, the teacher is really skilful, and excites in them a spirit of inquiry, and leads them in suitable ways to observe, to think, and to feel that the school is a happy place even for children, it is one great point gained.

We may suggest here, then, that it would be well to set apart a few minutes once a day for a *general exercise* in the school, when it should be required of all to lay by their studies, assume an erect attitude, and give their undivided attention to whatever the teacher may bring before them. Such a course would have its physiological advantages. It would relieve the minds of all for a few minutes. The erect attitude is a healthful one. It would also serve as a short respite from duty, and thus refresh the older scholars for study. We may further add, that for the benefit of these small children every general exercise should be conducted with reference *to them*, and such topics should be introduced as they can understand.

CONDUCTING RECITATIONS.

In considering a teacher's qualifications, the power of exciting an interest in the *recitations* of his school may not be overlooked. No man can be successful for any length of time without this. This comprises what is usually implied by APTNESS TO TEACH. All men have not this faculty by nature in an equal degree. Some may talk for an hour upon an interesting topic in the presence of children without commanding their attention; while there are others who can take even a common-place subject and secure for any length of time an all-absorbing interest in every word. This difference is seen in every grade of public speakers, and in all descriptions of writers: but perhaps more strikingly than anywhere else it is observable among teachers. Enter one school, and you may notice that the scholars are dull and listless; indifference sits undisturbed upon their brows; or perhaps they are driven by the activity of their own natures to some expedient to interest themselves, while the teacher is, with very commendable spirit, laboriously—perhaps learnedly—explaining some principle or fact designed for their edification. The secret is, he has not yet learned to awaken their attention; he fails to excite their interest.

Pass to another school. A breathless silence pervades the room; the countenances of the children, upturned towards the teacher, beam with delight. As he kindles into earnestness and eloquence, they kindle into responsive enthusiasm. Whenever his eye meets theirs, he sees—he *feels*, the glow radiated by the fire he is lighting in their souls, and his own gathers new warmth and enthusiasm in return. Such a man is *apt to teach;* and you could scarcely break the spell by which he holds his class, "though you should give them for playthings, shining fragments broken from off the sun."

He who possesses this gift naturally has very great advantage as a teacher to begin with. The ability to *tell well* what he knows is of more consequence to the teacher, than the greatest attainments without the power to communicate them. Combine high attainments with the ability to tell, and you have the accomplished teacher.

But this power to communicate is not necessarily a *natural gift;* it comes not always by intuition. It can be acquired. It is founded in philosophy; and he who can understand anything of the workings of his own mind, who can revert to the mental processes he went through in order to comprehend a principle, who can go back to that state of mind he was in before he comprehended it, and then by one step more can put himself in the place of the child he is teaching, realising exactly his perplexities and feeling his precise wants, can become the *apt teacher*. Those who fail in this are usually those who have forgotten the steps they took to acquire their own knowledge, or perhaps who never noticed what steps they did take.

To acquire this rare qualification should be the constant study of the teacher. To this end he should recall, as far as possible, the operations of his own mind in childhood. By studying his own mind, he learns, often most effectually, what he needs to know of others. Whenever he is preparing to teach any principle or fact to others, let him ask himself questions like the following:—What was the dark point in this when I studied it? Where did my mind labour most? What point did my teacher fail to explain? Such questions will frequently suggest the very difficulty which perplexes every mind in the same process. Again, the following inquiries may be very useful:—In studying this, what was the first point which appeared clear to me? After this, what was the second step, and *how* did that follow the first? The next in order? And the next? Was this the *natural order?* If not, what is the natural order? The right answers to these questions will suggest the course to be pursued in the instruction of a class.

The teacher can scarcely ask a more important question than this:—*What is the natural order of presenting a given subject?*

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The ability to determine this is what constitutes in a great degree the *science* of teaching. This inquiry should occupy much thought, because a mistake here is disastrous, and ever will be, as long as divine wisdom is superior to human. He who can ascertain the order of nature, will be most sure of exciting an interest in the subject he is endeavouring to teach.

Some further suggestions as to conducting school recitations are contained in the following paragraphs.

1. *The teacher should thoroughly understand what he attempts to teach.* It is destructive of all life in the exercise, if the teacher is constantly chained down to the text-book. We have no objection, indeed, that he should take his text-book with him to the class, and that he should occasionally refer to it to refresh his own memory, or to settle a doubt. But who does not know that a teacher who is perfectly familiar with what is to be taught, has ten times the vivacity of one who is obliged to follow the very letter of the book? His own enthusiasm glows in his countenance, sparkles in his eye, and leaps from his tongue. He watches the halting of the pupil, perceives his difficulty, devises his expedient for illustrating the dark point in some new way, and, at the proper moment, renders just the amount of assistance which the pupil needs. Not confined to the text, he has the use of his *eyes;* and when he speaks or explains, he can accompany his remark with a quickening look of intelligence. In this way his class is enlivened. They respect him for his ready attainment, and they are fired with a desire to be his equal.

How different is it with a teacher who knows nothing of the subject but what is contained in the text before him, and who knows *that* only as he reads it during the intervals occasioned by the hesitations of the class. Every question he proposes is printed at the bottom of the page; and as soon as he reads the question, without a glance at the pupil, his eye sets out on a chase after the answer in the text. If the scholar has not already been stupified by such teaching, and happens to give an intelligent answer, yet not in the precise language of the book, he is *set right* by the teacher's reading the very words,—just so much detached from the sentence as he fancies was intended to answer that one question! In this way he discourages thought in his pupils, and sets a bounty on mechanical study. In this way, too, he congeals whatever of interest they bring with them to the recitation, and they sink into indifference, — or, following the instincts of their nature, they seek occupation in play or mischief, even under the sound of his voice!

2. *The teacher should specially prepare himself for each lesson he assigns.* This is naturally suggested by what has just been said. The teacher's memory needs to be refreshed. We all know how difficult it would be to *recite* a lesson, in geometry for instance, weeks after studying it. It is so in other things. Now the teacher should be so familiar with the lesson which he proposes to hear recited, that he *could* recite it himself as perfectly as he would desire his scholars to do it. This is seldom the case. We have heard a teacher, with the text-book in his hands, complain of the dullness or inaccuracy of his classes, when, if the tables had been turned, and the pupils allowed to ask the questions, the teacher would scarcely have recited as well. And we may add, *this is no very uncommon thing!* If any one is startled at this assertion, let him request a friend, in whom he can confide, to ask him the questions of a particular lesson in geography, or history, or grammar. The teacher should daily study his class lessons. This will enable him the better to assign his lessons judiciously. In this daily study he should *master the text-book* upon the subject; and, more than this, he should consider what collateral matter he can bring in to illustrate the lesson. He should draw upon the resources of his own mind,—upon the treasures of his *common-place book,**—upon the contents of some encyclopædia, —upon *any* source, from whence he can obtain a supply of knowledge for his purpose. This will improve his own mind, and he will be encouraged, as from time to time he teaches the same branch, to find that he is able to do better than ever before, and that, instead of becoming weary with repetition, he is more and more enthusiastic in the subject.

Going thus to his class—so full of the subject, that were the text-book annihilated, he could make another and better one —he will have no difficulty to secure attention. As he speaks, his eye accompanies his word, and as his pupils answer, he sees the expression of their countenances; and what a world of meaning there is in this expression! It betrays, better than words can do, the clearness or obscurity of the mind's perception, when a truth is presented. How different the beaming of the eye when the soul *apprehends*, from that almost idiotic stare at vacuity when words are used without import. And how necessary it is that the teacher should be free to observe the inward workings of the soul as indicated upon the countenance.

3. *The teacher should be able to use our language fluently and correctly.* In this many are deficient. They hesitate and stammer, and after all express their ideas in vague terms, and perhaps by the use of inaccurate or inelegant language. A teacher in no way gives so effectual instruction in grammar as by his own *use* of our language; and there can be no sight more mortifying than that of a teacher labouring to fix in the minds of his class some rule of syntax, when his own language at the very moment shows an entire disregard of the rule. It is very common to hear teachers talk of "*sums*" to their classes in arithmetic, and even to ask them to do "sums" in subtraction or division! The term "*question*" is often as improperly applied, when no question is asked. The teacher should be accurate in the use of terms. "Question" is sometimes the proper word; sometimes "problem," and sometimes "exercise," or "example," may with more propriety be used; but "*sum*" means the *amount* of several numbers when added, and it should not be applied as the *name of an exercise.* Some teachers use the terms *ratio* and *proportion** interchangeably, as if they were synonyms. Such inaccuracies in the teacher will be sure to be reproduced in the school, and it is a great evil for the scholar to acquire a careless habit in the use of terms.

4. *He should have proper animation himself.* Horace Mann describes some of the Scotch teachers as working themselves up into a feverish excitement in the presence of their classes, and the classes in turn as literally bounding from the floor when they answer their hasty questions. Now while we think these Scotch teachers go quite too far, we do think that many of our own teachers come short of a proper standard of animation. A teacher should be ready without being rapid; animated, without being boisterous. Children are imitative beings; and it is astonishing to observe how very soon they catch the manner of the teacher. If he is heavy and plodding in his movements, they will very soon be dull and drowsy in theirs; then if he speaks in a sprightly tone and moves about with an elastic step, they almost realize a resurrection from the dead. If he appears absent-minded, taking but little interest in the lesson which is recited, they, will be as inattentive, at least, as he; while if all his looks and actions indicate

* It is an excellent plan for every teacher to keep a common-place book of considerable size, different portions of it being set apart for the different subjects upon which he is to give instruction. On the first twenty pages, "Geography" may be the *head*,—the next twenty pages may be set apart for "History,"—twenty more may be assigned to "Reading,"—and a like number to "Arithmetic," "Grammar," "Spelling," "Writing," etc., reserving quite a space for "Miscellaneous Matter." This would make a large book, but when it is remembered that it is to be used for several years, it is well to have it large enough to contain a large amount of matter. Now, whenever the teacher hears a lecture on a peculiar method of teaching either of these branches, let him note the prominent parts of it under the proper head, and *especially the illustrations.* When he reads or hears an anecdote illustrating Geography, History, or Grammar, let it be copied under the proper head. If it illustrates Geography, let the *name of the place* stand at its head. When he visits a school, and listens to a new explanation or a new process, let him note it under its head. In this way he may collect a thousand valuable things to be used with judgment in his school.

* We are reminded by this of the college student who was examined rather closely by his tutor. "What is ratio?" inquired the tutor. "Ratio?" said the young man, "ratio is proportion." "Well, what is proportion?" "Proportion? proportion is ratio." "Well, then," said the tutor, looking perplexed, "what are both together?" "Excuse me," said the pupil, "*I can define but one at a time!*"

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that the subject is of some importance, he will gain their attention. Nor can we refrain in this place from suggesting to the teacher the importance of regarding his manners while engaged in conducting a recitation. His *attitude* should not be one of indolence or coarseness,—and when he moves from his seat, and appears at the blackboard to illustrate any point, it should be done gracefully, and with a constant regard to the fact that every look and every motion *teaches*.

5. *He should never proceed without the attention of the class.* A loss of interest is sure to follow a want of attention. Besides, a habit of inattention, while it is very common, is also a great calamity to the person who falls into it during life. Many a sermon is lost upon a portion of the audience in our churches every Sabbath from this cause. When the attention is aroused, the impression made is enduring; and one idea then communicated is worth a hundred at any other time.

6. *Avoid a formal routine in teaching.* Children are very apt to imbibe the notion that they *study* in order to *recite*. They have but little idea of any purpose of acquirement beyond recitation; hence they study their text-book as mere words. The teacher should, as soon as possible, lead them to study the *subject*, using the book simply as an *instrument*. "Books are but helps"—should become their motto. In order to bring this about, the instructor would do well occasionally to leave entirely the order of the book, and question them on the *topic* they have studied. If they are pursuing arithmetic, for instance, and they have carefully prepared a definite number of problems, it might be well to test their ability by giving them at the recitation others of the teacher's own preparing, involving an application of what they have learned of the business of life. This will lead them to study intelligently. Besides, as soon as they begin to see how their knowledge is to be *useful* to them, they have a new motive to exertion. They should be so taught as to discover that grammar will improve their understanding and use of language; that writing will prepare them for business, and by enabling them to communicate with their friends, will add to their enjoyment; and so of reading and the other branches.

7. *Be careful to use language which is intelligible to children whenever an explanation is given.* The object of an explanation is to elucidate, to make clearer. How is this object accomplished when the explanation is less intelligible than the thing explained? Suppose a child should ask her teacher to explain the cause of cold in winter and heat in summer? in other words, the cause of the change of seasons. "Oh, yes," says he pleasantly. "The annual revolution of the earth round the sun in connection with the obliquity of the ecliptic, occasions the succession of the four seasons." The child listens to these "words of learned length," and is astonished at the learning of her teacher, but she has no clearer idea than before of the point she inquired about.

Mr. S. R. Hall in his lectures gives the following forcible illustration of the same point. "'Will you please to tell me why I carry one for every ten?' said little Laura to her instructor. 'Yes, my dear,' said he kindly. 'It is because numbers increase from right to left in a decimal ratio.' Laura sat and repeated it to herself two or three times, and then looked very sad. The master as soon as he had answered pursued his other business and did not notice her. But she was disappointed. She understood him no better than if he had used words of another language. 'Decimal' and 'ratio' were words that might have fallen on her ear before, but if so, she understood them none the better for it. She looked in the dictionary and was disappointed again, and after some time put away her arithmetic. When asked by her teacher why she did so, she replied, 'I dont like to study it; I can't understand it.'

"Now the injury to little Laura was very great. She had commenced the study with interest; she had learned to answer a great many questions in arithmetic and had been pleased. She was now using a slate and writing her figures on it, and had found the direction to carry one for every ten. This she might have been made to understand. The master loved his scholars and wished to benefit them, but *forgot that terms perfectly plain to him would be unintelligible to the child.* From that moment Laura disliked arithmetic, and every effort that could be used with her could not efface the impression that it was a hard study, and she could not understand it."

While upon this subject, we might urge that teachers should not resort to *evasion* when they are *not able* to explain. It is a much more honourable, and far more satisfactory course, for the teacher frankly to confess his inability to explain, than to indulge in some ridiculous mysticism to keep up the show of knowledge. The following story was told me by a friend. "I may never forget the passage I first made through the *Rule of Three*, and the manner in which my manifold perplexities respecting 'direct and inverse' proportion were solved. 'Sir,' said I, after puzzling a long time over 'more requiring more and less requiring less'—'will you tell me why I sometimes multiply the second and third terms together and divide by the first—and at other times multiply the *first* and *second* and divide by the third?' 'Why, because more requires more sometimes, and sometimes it requires less—to be sure. Haven't you read the rule, my boy?' 'Yes, sir, I can repeat the rule, but I don't *understand* it.' 'Why, it is because 'more requires more and less requires less!' 'But *why*, sir, do I multiply as the rule says?' 'Why, because 'more requires more and less requires less'—see, the *rule says so*.' 'I know the rule says so, but I wished to understand *why*.' 'Why? *why?*' looking at me as if idiotcy itself trembled before him—'why?—why because the *rule says so; don't you see it?—More requires more and less requires less!*' —and in the midst of this inexplicable combination of more and less, I shrunk away to my seat blindly to follow the rule because *it said so.*" Such teaching as this is enough to stultify the most inquiring mind; and it is to secure the *blessing of relief from such influence* to the children of any particular district, that we come to consider an occasional change of teachers a *mitigated* evil.

(To be continued.)

ANSWERS TO CORRESPONDENTS.

L. M.—The mango, called by the Indians *amu*, is a rich fruit of a bright orange-coloured pulp, and a coat of orange or green intermingled with a red bloom. There are in India many sorts and varieties of this rich fruit, which, from its abundance, might be called the Indian apple. "As a mere tree," says Mr. Stocqueler, "it is valuable, being of not very slow growth, and affording, by its dense dark shade, the most grateful shelter from the 'traveller's enemy,' the sun. Its wood is most extensively used, and, in fact, the planks supply, for a large part of India, the uses of fir planks in Europe; and when carefully preserved by paint, it lasts many years. The fruits, in their season, are so abundant in all the bazaars that the cows are often regaled with them." The finest mangoes on the Bengal side of India are said to be those of Malda.

STUDENT.—The middle and latter half of the eighteenth century are memorable for the production of some of the most enlightened, elaborate, and conclusive defences of Christianity. It is sufficient to name Lardner, whose "Credibility of the Gospel History" is a work of standard excellence; Butler, whose "Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature," will lose none of its force, none of its value, by the progress of time; Conybeare, whose able "Defence of Revealed Religion against Tindal's 'Christianity as Old as Creation'" is an armoury from which the believer may select his weapons and challenge his proudest foe. Little more could have been done than was done in that age to preserve the outworks of Christianity; while the inward power of that Christianity was felt in the hearts of thousands by the powerful preaching of the Gospel by Whitfield, Wesley, and others.

ANXIOUS.—Never mind the remarks of either the censorious or the captious. Do you persevere in the good path you have selected. The influence of enemies upon a really sound character is always healthful. A certain degree of recognition and praise does any man good; but the usual effect of a good deal of it is debilitating; it injures the character of almost every man. Praise is very sweet, but the soul can no more thrive on it than the body on a diet of sugar. It is really well for every man to have enemies, to hear what they say about him, and to experience the weight of their opposition. Enemies drive the soul home to its motives, rouse its finest energies, compact its character, render it watchful of the issues of its life, keep it strung up to its work, and help to eliminate from it selfish considerations. Take care of your character, and never mind your enemies. The malice of others may tarnish a good *name*—may blacken *reputation*; but the *character*, which is much more valuable than mere reputation, can receive no injury, save by the voluntary act of its owner.

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ON PHYSICS, OR NATURAL PHILOSOPHY. No. LXXVI.

(*Continued from page* 354.)

METEOROLOGY.

AQUEOUS METEORS.

Dew, Mist, White Frost.—Dew is merely vapour which is deposited in drops upon objects during the night. This phenomenon is owing to the cooling of bodies on the surface of the earth through the nocturnal radiation of heat. The temperature of such bodies being reduced several degrees below that of the air, the consequence is, especially in warm seasons, that this temperature is below that at which the atmosphere is capable of retaining moisture in the form of vapour. The strata of air in contact with the bodies and at about the same temperature, then deposit a part of the vapour which they contain, a phenomenon analogous to that which is produced when a decanter or glass of cold water is placed upon anything warm and moist, and the vapours in the air are condensed upon the sides of the vessel.

According to this theory, which is that of our countryman Wells, all the causes which favour the cooling of bodies increase the quantity of dew. These causes are: the radiating power of the bodies, the state of the sky, and the agitation of the air. Bodies which have a great power of radiation cool sooner, and ought, therefore, to condense more vapour. And, in fact, it is found, that the deposit of dew is generally nothing upon metals, their radiating power being slight, especially if they are polished, while the earth, sand, glass, and plants, which have great radiating power, are all plenteously covered with dew.

The state of the sky has also a great influence upon dew. If it is covered with clouds, these clouds act as reflectors and send back the radiating heat to the earth, so that the cooling does not generally reach the point necessary for the formation of dew. Still more does this take place when the bodies, instead of being freely exposed to the air, are covered by any sort of protection.

The wind has also an influence upon the quantity of vapour deposited. If it is gentle, it may increase the quantity by renewing the air; but if it is strong, it usually diminishes it, the contact of the air with the bodies not being sufficiently prolonged to produce condensation. Lastly, the deposit of dew is more copious in proportion as the air is damp.

Mist is a precipitation of water in the form of very small rain, and yet not having the appearance of cloud. This phenomenon is produced during intense heat in damp countries at sun-set, when the lower strata of the atmosphere are cooled below the point at which they are capable of holding vapour in suspension.

White frost or *hoar frost* is nothing but congealed dew.

Snow, Sleet, Glazed Frost.—Snow is water solidified in small star-like crystals, variously ramified and floating in the atmosphere. These crystals are produced by the congealing of the vesicular vapour in the clouds, when the temperature of these clouds is at freezing point. Their regularity is in proportion to the calmness of the air in which they are formed. To be observed, they must be received upon a dark substance, and examined carefully with a powerful lens. The regularity and, at the same time, the variety of their forms, are truly admirable. The most common form is that of a prism with six faces.

There is more snow at a place in proportion as it is nearer the poles or more elevated above the level of the sea. Towards the poles the earth is constantly covered with snow. The same takes place with high mountains, where perpetual snow reigns, even in equatorial regions.

Sleet, which is also solidified water, is formed of small needles of ice pressed against one another in a confused manner. The formation of it is ascribed to the sudden congealing of the vapour in the clouds when the air is in an agitated state.

Glazed frost is a layer of ice, compact and transparent, which is formed upon the ground and on the surface of bodies. The conditions necessary for its formation are, that the temperature of the earth should be below freezing point, and that after some days of continual cold, a little rain should fall. This rain then freezes immediately; but if it falls in a larger quantity, the ground becomes warmer, and no glazed ice is formed.

Hail is a collection of compact ice globules, of various sizes, which fall from the atmosphere. In our climate, hail falls chiefly in spring and summer, and in the warmest parts of the day, rarely falling in the night. The fall of hail is always preceded by a peculiar rustling in the air.

Hail is generally the precursor of storms, but rarely accompanied by them, and still more rarely preceded by them. The size of the hail-stones is very variable, not unfrequently equalling that of a hazel-nut, and in some few instances approaching that of a pigeon's egg. No theory yet known satisfactorily explains the formation of the hail-stones, and especially how it is that they attain to such a size and weight before falling. According to Volta's theory, they are successively attracted by two clouds charged with contrary electricity; but if the hail-stones were thus attracted, much more would the two clouds be mutually attracted and blended together.

LUMINOUS METEORS

Atmospheric Electricity. Franklin's Experiment.—The most frequent and most remarkable luminous phenomena are those produced by the free electricity which exists in the atmosphere. The philosophers who first observed the electric spark, immediately compared it to lightning, and the clattering sound which accompanies it to the sound of thunder. But Franklin was the first who, by means of electric batteries of his own invention, was enabled to establish a perfect analogy between lightning and electricity, and to point out—as he did in a paper published in 1749—the experiments by which the electricity of heavily charged clouds may be withdrawn from them by means of metallic points. Guided by Franklin's theoretical ideas, Dalibard, a French philosopher, prepared, in a garden at Marly, near Paris, a bar of isolated iron, about fifty feet long, which on the 10th of May, 1752, under the influence of a stormy cloud, gave forth sparks strong enough to charge Leyden jars. Meanwhile Franklin was also preparing to make the experiment which he had indicated. For this purpose he was getting a steeple erected, and while it was in course of erection, it occurred to him to make use of a kite furnished with a metallic point, which might reach very high regions of the atmosphere. In June, 1752, during a storm, and before he had heard of Dalibard's experiment, he went out into a field near Philadelphia with his young son. There, having sent up the kite, he attached a key to the string and a piece of silk cord to the key, in order to isolate the apparatus. He then fastened the silk cord to a tree. Having put his hand near the key, he obtained no spark at first, and began to despair of success, when, a little rain having fallen, the string became a good conductor, and the key gave out the spark he was so anxious to see. His emotion on perceiving it was so powerful, that—as he relates in his letters—he could not refrain from tears of joy.

Franklin, who had discovered the power of the metal points—without, however, understanding the theory—considered that the kite withdrew the electricity from the cloud; but according to the theory of electrisation by influence or induction, the phenomenon is to be explained by the influence which the electric cloud exercised upon the kite and the string.

Apparatus for estimating the Electricity in the Atmosphere.—The apparatus employed for ascertaining the presence of electricity in the atmosphere are the electrometer with cork balls, straws, or gold leaf, Dalibard's apparatus, arrows thrown in the air, and kites or balloons fastened to the ground.

To observe electricity in fine weather, when the tension is generally slight, it is better to make use of the electrometer which Saussure employed for this kind of investigation. It is an electrometer, like the gold-leaf electrometer, which we described in a former lesson, but the rod which has the gold-leaf or pieces of straw is surmounted by a conductor about two feet high, with a ball or point at the end. To keep the apparatus from the rain, it is covered with a brass conical cap, about four inches in diameter. The glass case, which is square instead of cylindrical, as in fig. 385, is about a foot and a half each way, and a graduated dial applied to its front side indicates the angle of divergence of the gold leaf or straws.

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This electrometer gives no sign of atmospheric electricity, unless it is raised in the atmosphere so as to be brought into strata of air whose electric condition is superior to its own. An elevation of a foot is sufficient to produce a divergence of 20 degrees, in consequence of the excess of electricity.

Saussure also made use of a copper ball, which he threw vertically up into the air. This ball was fastened to one end of a metallic wire, the other end being attached to a ring capable of sliding along the conductor of the electrometer. According to the divergence of the gold leaf or straws, may the electrical condition of the air, at the height which the ball has reached, be estimated. M. Becquerel, in his experiments made on Mount St. Bernard, improved Saussure's apparatus by using an arrow discharged from a bow instead of the ball. A silk cord, covered with tinsel, about two hundred and sixty feet long, was fastened to the arrow at one end and connected at the other with the rod of an electrometer.

When the object is to observe the electricity in the clouds, as the electric tension is then very considerable, a long metal bar with a point at the end, like that used by Dalibard in the above-mentioned experiment, is generally employed. This bar, which is carefully isolated, is fastened to the top of a building, and its lower part is connected with an electrometer, or even an electric-chime, fig. 392, which announces the presence of electric clouds. But as the bar may then give out dangerous sparks, a metal ball, whose connection with the ground is well established, should be placed near, between the bar and the observer, in order that, if the spark appears, it may strike the ball and not the observer. Richmann, a philosopher at St. Petersburg, was killed in an experiment of this sort by a spark which struck him on the face.

Lastly, kites with a metal point, as in Franklin's experiment, and connected by means of a cord covered with tinsel, with an electrometer, and balloons fastened by metallic cords, are sometimes employed for the purpose of detecting the presence of electricity in the atmosphere.

Ordinary Electricity of the Atmosphere.—By means of the various apparatus just described it has been proved that the atmosphere contains electricity not only during a thunderstorm, but that at all times there is free electricity in the air, sometimes positive and sometimes negative. When the sky is clear and free from clouds, it is always positive electricity that is observed in the atmosphere, but this electricity varies in intensity with the height of the place and the hours of the day. The greatest intensity is found in the most elevated and most isolated places. In houses or streets, and under trees, no trace of positive electricity is observed. In towns, positive electricity is perceptible only in open parts, on quays and bridges. In all cases positive electricity is not perceived, except at a certain height from the ground. It does not become perceptible in open country at less than a height of about four feet. It increases according to a law which is not known and which depends upon the hygrometrical state of the atmosphere.

At sun-rise the excess of positive electricity in the atmosphere is slight. It increases up to eight or eleven o'clock, according to the season, and is then at its highest point. It afterwards decreases rapidly, till a little before sun-set, and again increases, till it reaches a second maximum point a few hours after sun-set. For the rest of the night the electricity decreases. These increasing and decreasing periods, which are observed throughout the whole year, are more perceptible in proportion as the sky is clear and the weather calm. Lastly, the positive electricity of fine weather is much stronger in winter than in summer.

When the sky is cloudy, the electricity in the atmosphere is sometimes positive and sometimes negative. Indeed, it often happens that the electricity changes its sign several times in the day through the passing of an electrised cloud. During thunderstorms, and when it rains or snows, the atmosphere is electrised positively one day and negatively another, and the numbers of the two sorts of days are about equal. The electric tension may become so powerful as to render the rain sparkling, a phenomenon of which several instances have been observed.

With regard to the electricity of the earth, Peltier has ascertained, by means of the multiplier, that it is always negative, but in different degrees, according to the hygrometrical state and the temperature of the air.

Causes of the Electricity in the Atmosphere.—Various hypotheses have been started to explain the origin of atmospherical electricity. Some have attributed it to the friction of the air against the ground, others to the growth of plants, and others to the evaporation of water. Some have compared the earth to a vast Voltaic pile or battery, others to a thermo-electrical apparatus. Several of these causes may contribute to the phenomenon, but only one has been substantiated, and that is the evaporation of water from the surface of the ground.

Volta was the first who showed that the evaporation of water produces electricity. M. Pouillet has since found that if the water is distilled, evaporation never occasions any liberation of electricity, but if the water holds an alkali or a salt in solution, even in a small quantity, the vapour is electrised positively and the solution negatively. If the water is combined with an acid, the reverse takes place. It is conceived, therefore, that, as the waters at the surface of the earth and in the sea always contain saline substances in solution, the vapours which are given out must be electrised positively and the earth negatively.

To establish the development of electricity by evaporation, rub a platinum capsule hard, and pour a small quantity of liquid into it, and then put it upon the upper plate of a condensing electrometer, fig. 401, taking care to connect the lower plate with the ground. The water in the capsule having evaporated, break the connection with the ground, and remove the upper plate. The gold leaf will then diverge if the water held several foreign substances in solution, but remains unmoved if the water was distilled.

M. Pouillet has in the same manner proved that when wood or charcoal burns, a current of carbonic acid electrised positively is given out, while the charcoal remains charged with negative electricity.

Electricity of the Clouds.—In general the clouds are electrised, sometimes positively and sometimes negatively, and they differ from each other only in the degree of their electric tension. The formation of positive clouds is easily explained, since the vapours which rise from the ground, and are condensed into clouds in the upper regions of the atmosphere, are themselves electrised positively. As for the negative clouds, it is considered that they result from the fogs, which, by their contact with the ground, are charged with negative fluid, which they retain when they rise in the atmosphere; or that, being separated from the ground by strata of air charged with moisture, they have been electrised negatively by the influence of the positive clouds which have repelled the positive electricity into the earth.

BIOGRAPHY.—No. XXVII.

MRS. TROLLOPE.

This lady has acquired a wide notoriety, and made large profits by her writings; yet few of her sex would, probably, be willing to stand in her place, and bear her name, for all she has gained. Born in England, about 1787, she was unknown to literary fame until she had reached the sober season of married and middle life, when she suddenly burst forth like a meteor, whose erratic course makes it an object of curiosity its own nature would never have awakened. In this sketch of Mrs. Trollope we shall give the notices by her own countrymen, British critics, whose fairness regarding her productions, on all points save one, may be considered established. Mr. Chambers, in his "Cyclopædia of English Literature," thus expresses his opinion:—"Mrs. Trollope first came before the public in 1832, when her 'Domestic Manners of the Americans' was published, and excited much attention. She drew so severe a picture of American faults and foibles—of their want of delicacy, their affectations, drinking, coarse selfishness, and ridiculous peculiarities—that the whole nation was incensed at their English satirist. There is much exaggeration in Mrs. Trollope's sketches; but having truth for their foundation, her book is supposed to have had some effect in reforming the 'minor morals' and social habits of the Americans. The same year our authoress continued her satirie por-

traits in a novel entitled 'The Refugee in America,' marked by the same traits as her former work, but exhibiting little art or talent in the construction of a fable. Mrs. Trollope now tried new ground. In 1833 she published 'Belgium;' and 'Western Germany' in 1834; countries where she found much more to gratify and interest her than in America, and where she travelled in generally good humour. The only serious evil which Mrs. Trollope seems to have encountered in Germany was the tobacco-smoke, which she vituperates with unwearied perseverance. In 1837 she presented another novel, 'The Vicar of Wrexhill,' an able and entertaining work, full of prejudices, but containing some excellent painting of manners and eccentricities. In 1838 our authoress appears again as a traveller. 'Vienna and the Austrians' was of the same cast as 'Belgium and Germany,' but more deformed by prejudice. This journey also afforded Mrs. Trollope materials for a novel, which she entitled 'A Romance of Vienna.' Three novels were the fruit of 1839; namely, 'The Widow Barnaby,' a highly amusing work, particularly the delineation of the hustling, scheming, unprincipled husband-hunting widow; 'Michael Armstrong, or the Factory Boy,' a caricature of the evils attendant on the manufacturing system; and 'One Fault,' a domestic story, illustrating with uncommon vigour and effect the dismal consequences of that species of bad temper which proceeds from pride and over-sensitiveness. In 1840 we had 'The Widow Married;' and in 1841 'The Blue Belles of England,' and 'Charles Chesterfield.' The latter relates the history of a youth of genius, and contains a satirical picture of the state of literature in England, branding authors, editors, and publishers with unprincipled profligacy, selfishness, and corruption. In 1842 Mrs. Trollope, besides throwing off another novel, 'The Ward of Thorpe Combe,' gave the public the result of a second visit to Belgium, describing the changes that had been effected since 1833, and also 'A Visit to Italy.' The smart caustic style of our authoress was not so well adapted to the classic scenes, manners, and antiquities of Italy, as to the broader features of American life and character, and this work was not so successful as her previous publications. Returning to fiction, we find Mrs. Trollope, as usual, prolific. Three novels, of three volumes each, were the produce of 1843—'Hargrave,' 'Jessie Phillips,' and 'The Lauringtons.' The first is a sketch of a man of fashion; the second an attack on the new English poor-law; and the third a lively satire on 'superior people,' the 'bustling Botherbys' of society. Reviewing the aggregate labours of this industrious authoress, we cannot say that she has done good proportioned to her talents. Her satire is directed against the mere superficialities of life, and is not calculated to check vice or encourage virtue. In depicting high life, she wants the genial spirit and humanity of Theodore Hook. She has scattered amusement among novel-readers by some of her delineations; but in all her mirth there is a mocking and bitter spirit, which is often as misplaced as it is unfeminine."

From another critic, Mr. R. H. Home, author of "A New Spirit of the Age," we take the following:—"The class to which Mrs. Trollope belongs is, fortunately, very small; but it will always be recruited from the ranks of the unscrupulous, so long as a corrupt taste is likely to yield a trifling profit. She owes everything to that audacious contempt of public opinion which is the distinguishing mark of persons who are said to *stick at nothing*. Nothing but this sticking at nothing could have produced some of the books she has written, in which her wonderful impunity of face is so remarkable. Her constitutional coarseness is the natural element of a low popularity, and is sure to pass for cleverness, shrewdness, and strength, where cultivated judgment and chaste inspiration would be thrown away. Her books of travel are crowded with plebeian criticisms on works of art and the usages of courts, and are doubtless held in great esteem by her admirers, who love to see such things overhauled and dragged down to their own level. The book on America is of a different class. The subject exactly suited her style and her taste, and people looked on at the fun as they would at a scramble of sweeps in the kennel; while the reflecting few thought it a little unfair in Mrs. Trollope to find fault with the manners of the Americans. Happy for her she had such a topic to begin with. Had she commenced her literary career with Austria or France, in all likelihood she would have ended it there.

"But it is to her novels she is chiefly indebted for her current reputation; and it is here her defects are most glaringly exhibited. She cannot adapt herself to the characterisation requisite in a work of fiction; she cannot go out of herself; she serves up everything with the same sauce; the predominant flavour is Trollope still. The plot is always preposterous, and the actors in it seem to be eternally bullying each other. She takes a strange delight in the hideous and revolting, and dwells with gusto upon the sins of vulgarity. Her sensitiveness upon this point is striking; she never omits an opportunity of detailing the faults of low-bred people, and even goes out of her way to fasten the stigma upon others who ought to have been more gently tasselled. Then her low people are sunk deeper than the lowest depths, as if they had been bred in and in, to the last dregs. Nothing can exceed the vulgarity of Mrs. Trollope's mob of characters, except the vulgarity of her select aristocracy. That is transcendent—it caps the climax.

"We have heard it urged on behalf of Mrs. Trollope, that her novels are, at all events, drawn from life. So are sign-paintings. It is no great proof of their truth, that centaurs and griffins do not run loose through her pages, and that her men and women have neither hoofs nor tails. The tawdriest wax-works, girt up in paste and spangles, are also 'drawn from life;' but there ends the resemblance."

A few words are all that is needed to explain her dislike of America. We quote from a sketch which appeared in the "Knickerbocker" in 1833, written by the Rev. Timothy Flint, who resided in Cincinnati during the sojourn of Mrs. Trollope in that city. His judges her more kindly than do her English critics:—

"In reply to the question which has been asked us, we are sure, a thousand times, what sort of a person was Mrs. Trollope, and what were her objects in visiting America? we reply, she was in person a short, plump figure, with a ruddy, round, Saxon face, of bright complexion, forty-five, though not showing older than thirty-seven; of appearance singularly unladylike, a misfortune heightened by her want of taste and female intelligence in regard to dress, or her holding herself utterly above such considerations, though at times she was as much finer and more expensively dressed than other ladies, as she was ordinarily inferior to them in her costume. Robust and masculine in her habits, she had no fear of the elements; recklessly exposing herself in long walks to the fierce meridian sun or the pouring shower, owing a severe fever, no doubt, to those circumstances. Voluble as a Frenchwoman, shrill and piercing in the tones of her voice, piquant and sarcastic in the tenor of her conversation, she was a most accomplished mimic; and as she had travelled in France and Italy, and knew the language and light literature of both these countries, and was, moreover, acquainted, as we knew from her correspondence, with the most distinguished men and women of genius in England; as she was, in particular, perfectly *au fait* in regard to everything that concerned theatricals, and play-writing and play-going people; as she had seen everybody and knew everybody in Europe of whom we hear, her conversation was remarkably amusing.

"She was in correspondence while in this country, as we know, with Miss Mitford and Miss Landon, and, we believe, with Campbell, the poet, and other names well known to fame. Having been trained to the expectation of inheriting a great fortune, and having views of conventional morals and decorum not of the severer class, not restrained by religious considerations, and mixing much with the gay and pleasure-seeking, she had probably run through the common and allowed range of fashion, and exhausted the common forms of pleasure and worn it all out to satiety; though we have every reason to believe that, while in America, whatever liberty she may have taken with the lesser morals, she was exemplary in her observance of the higher duties; she was amiable in the highest degree in her relations with the people about her in the suburbs of Cincinnati, where she resided during the greater part of her stay in America, and among whom she was extremely popular, enacting among them Lady Bountiful with a graciousness of distribution, and nursing the sick, which everywhere gains favour. Besides Hervieu, an

accomplished French painter, she was accompanied by her son and two daughters."

Mr. Flint goes on to state, that Mrs. Trollope came to America in the spring of 1829, to co-operate with Miss Fanny Wright, another British eccentric, who, at Nashoba, Tennessee, was engaged in her famous and failing experiment of cultivating the Ethiopians. Mrs. Trollope was soon disgusted. After spending two days at Nashoba, she fled from the negro settlement, came to Cincinnati, Ohio, where she passed two winters building her huge Turkish bazaar, which cost her 24,000 dollars: she then departed for England. But the disappointment of her hopes was not her severest trial. Owing to her want of letters of introduction and to her vulgar appearance, she was never visited or invited into society while in Cincinnati, never attended a party, nor was admitted into but four families; and those, though respectable, did not give parties. Such was her knowledge of America.

We have not named all her works. In 1849 she published "Young Love," a novel, which a writer in the "Athenæum" thus reports:—"The masculine vigour and shrewdness developed in Mrs. Trollope's earlier novels, won for them a popularity which is fast waning, from the sameness of material and feebleness of plot exhibited in each succeeding work. The announcement, however, of one bearing the above title, was likely enough, after the politic fashion of Mr. Bayes, to 'surprise' the public into a purchase, although it did not in the slightest degree whet our appetite; for we should be perplexed to name a writer less likely to portray, in its truth and beauty, the purity and poetry, 'to dally with the innocence' of 'Young Love.'"

THEORY AND PRACTICE OF TEACHING.
No. VI.

CONDUCTING RECITATIONS—*continued.*

8. *Require prompt and accurate recitation.* We know of nothing that will abate the interest of a class sooner than dull and dragging recitation. The temptation in such cases is very strong for the teacher to help the class by the "drawing-out process" before described. This, however, only makes the matter worse. The dull recitation calls for the teacher's aid; and his aid reproduces the dull recitation. The only way is to stop at once, and refuse to proceed till the recitation can *go alone*. It is just as easy to have good lessons as poor; and the teacher should have the energy to insist upon them. Mark the countenances of a class as they go to their seats after a good recitation. They feel that they have done something, and they look as if they valued the teacher's approbation and their own so highly, that they will learn the next lesson still better.

It is, moreover, a great saving of time to have the lessons promptly recited. This saving will afford the opportunity to introduce those additional illustrations we have before suggested, in order to excite a still deeper interest. It may sometimes, though not always, be well to make a prompt and perfect recitation the *condition* of introducing the additional matter.

9. *Rely not too much upon simultaneous recitation.* This has become quite too fashionable of late. It had its origin in the large schools established some years since, known as Lancasterian schools, and perhaps was well enough adapted to schools kept upon that plan in large cities. But when this mode of reciting is adopted in our district and country schools, where the circumstances of large numbers and extreme backwardness are wanting, it is entirely uncalled for, and like other city fashions transferred to the country, is *really out of place*.

Seriously, we look upon this as one of the prominent faults in many of our schools. It destroys all independence in the pupil by taking away his individuality. He moves with the phalanx. Learning to rely on others, he becomes superficial in his lessons. He is tempted to indolence by a knowledge that his deficiencies will not stand out by themselves; and he comforts himself after a miserable recitation with the consoling reflection that he has been able to conceal his want of thoroughness from his teacher.

It may *sometimes* be useful. A few questions thus answered may serve to give animation to a class when their interest begins to flag; but that which may serve as a *stimulant* must not be relied on for *nutrition*. As an example of its usefulness, we have known a rapid reader tamed into due moderation by being put in companionship with others of slower speech, just as we tame a friskful colt by harnessing him into a team of grave old horses. But aside from some such definite purpose, we have seen no good come of this innovation. We are satisfied its prevalence is an evil, and worthy of the careful consideration of teachers.

By the foregoing means, and others that will suggest themselves to the thoughtful teacher's mind, he can arouse the interest of his classes so that study will be more attractive than play. For this object every teacher should labour. It is of course impossible to give specific rules to meet every case; it is not desirable to do it. The teacher, put upon the track, will easily devise his own expedients; and *his own*, be it remembered, *will usually be found the best for him.*

As a motive for every teacher to study carefully the art of teaching well at the recitation, it should be borne in mind that then and there he comes before his pupils in a peculiar and prominent manner; it is there his mind comes specially in contact with theirs, and there that he lays in them, for good or for evil, the foundations of their mental habits. It is at the recitation, in a peculiar manner, that he makes *his mark* upon their minds; and as the seal upon the wax, so his mental character upon theirs leaves its impress behind!

EXCITING INTEREST IN STUDY.

It is ever an interesting question to the teacher, and one which he should consider with great care—"How can I excite an interest among my pupils in their studies?" The intelligent teacher feels that this is *the* great question; for he foresees that, if he fails here, his difficulty in governing his school will be very much increased. He therefore turns his attention with deep solicitude to the *motives* he may present, and the methods he may employ to awaken and keep alive the interest of the school.

If he has reflected at all upon the subject, he has already arrived at the conviction, that it is necessary for the good of all concerned that the interest awakened should be an abiding one; that it should not only not abate during the term of school, but continue—nay, grow stronger and stronger—even after school-days have passed away. There is probably no greater mistake in education than that of raising in school an artificial excitement, which may aid perhaps in securing better recitations, but which will do nothing towards putting the mind into such a state, that it will press on in the pursuit of knowledge even after the living teacher has closed his labours.

The higher principles of our nature being aroused with difficulty, are too apt to be neglected by the teacher, and thus they remain in their original feebleness; while he contents himself with appealing to our lower characteristics,—thus doing a lasting injury by unduly cultivating and strengthening them, at the same time that he awakens after all but a temporary interest.

In view of the importance of the subject, and the difficulty of judging aright upon it, we shall make no apology for devoting a brief space to the consideration of

INCENTIVES TO STUDY—EMULATION.

The teacher will find in a greater or less degree, in the mind of every child, the principle of EMULATION. It is a question very much debated of late, *What shall he do with it?* Much has been said and written on this question, and the ablest minds, both of past ages and the present, have given us their conclusions respecting it; and it often increases the perplexity of the young teacher to find the widest difference of opinion on this subject among men upon whom in other things he would confidingly rely for guidance. Why, asks he, why is this? Is there no such thing as truth in this matter? or have these men misunderstood each other? When they have written with so much ability and so much earnestness,—some zealously recommending emulation as a safe and desirable principle to be encouraged in the young, and others as warmly denouncing it as altogether unworthy and improper,—

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have they been thinking of the *same thing?* Thus perplexed with conflicting opinions, he is thrown back upon his own reflection for a decision; or, what is more common, he endeavours to find the truth by *experimenting* upon his pupils. He tries one course for one term, and a different one the next; repeats both during the third, and still finds himself unsettled as he commences the fourth. Meantime some of his experiments have wrought out a lasting injury upon the minds of his pupils; for, if every teacher must settle every doubt by new experiments upon his classes, the progress that is made in the science and art of teaching must be at the untold expense of each new set of children;—just as if the young doctor could take nothing as settled by the experience of his predecessors, but must try over again for himself the effect of all the various medical agents, in order to decide whether arsenic does corrode the stomach and produce death,— whether cantharides can be best applied inwardly or outwardly,—whether mercury is more salutary when administered in ounces or grains, or whether repletion or abstinence is preferable in a fever! When such is the course of a young *practitioner* in a community, who does not confidently expect the churchyard soon to become the most populous district, and the sexton to be the most thrifty personage in the village, unless indeed he too should become the subject of experiment.

But is there not a good sense and a bad sense associated with the term Emulation?—and have not these eager disputants fallen into the same error, in this matter, that the two knights committed, when they immolated each other in a contest about the question whether a shield was gold or silver, when each had seen *but one side of it?* We incline to the opinion that this is the case,—and that those who wax so warm in this contest, would do well to give us at the outset a careful *definition of the term* EMULATION, as they intend to use it. This would perhaps save themselves a great deal of toil, and their readers a great deal of perplexity.

Now it seems to us the truth on this question lies within a nutshell. If emulation means a *desire for improvement, progress, growth,*—an ardent wish to rise above one's present condition or attainments,—or even an aspiration to attain to eminence in the school or in the world, it is a laudable motive. *This is self-emulation.* It presses the individual on to surpass himself. It compares his present condition with what he would be—with what he ought to be; and "forgetting those things which are behind, and reaching forth unto those which are before, he presses towards the mark for the prize." "An ardour kindled by the praiseworthy examples of others, inciting to imitate them, or to equal, or even excel them, without the desire of depressing them,"* is the sense in which the apostle uses the term [Romans xi. 14] when he says: "If by any means I may provoke to *emulation* them which are my flesh, and might save some of them." If this be the meaning of emulation, it is every way a worthy principle to be appealed to in school. This principle exists to a greater or less extent in the mind of every child, and may very safely be strengthened by being called by the teacher into lively exercise; provided always, that the eminence is sought from a desire to be useful, and not from a desire of self glorification.

But if emulation, on the other hand, means a *desire of surpassing others* for the *sake of surpassing them*; if it be the disposition that will cause an individual to be as well satisfied with the highest place, whether he has risen above his fellows by his intrinsic well-doing, or they have fallen below him by their neglect; if it puts him in such a relation to others that *their failures* will be as gratifying to him as *his own success*; if it be a principle that prompts the secret wish in the child that others may miss their lessons in order to give him an opportunity to gain applause by a contrast with their abasement,—then without doubt it is an unworthy and unholy principle, and should never be encouraged or appealed to by the teacher. It has no similitude to that spirit which prompts a man to "love his neighbour as himself." It has none of that generosity which rejoices in the success of others. Carried out in after-life, it becomes *ambition*, such as fired the breast of a Napoleon, who sought a throne for himself, though he waded through the blood of millions to obtain it.

* Dr. Webster.

It is to this principle that the apostle, before quoted, alludes when he classes *emulation* with the "works of the flesh," which are these: "adultery, fornication, uncleanness, lasciviousness, idolatry, witchcraft, hatred, variance, EMULATION, wrath, strife, seditions, etc.,—of the which things, I tell you before, as I have told you in times past, that they which do such things shall not inherit the kingdom of God." It is of this principle that the commentator, Scott, remarks:—"This thirst for human applause has caused more horrible violations of the law of love, and done more to desolate the earth, than even the grossest sensuality ever did."

Thus *Emulation* is a term which indicates a very good or a very bad thing, according to the definition we give it. In one view of it, the warmest aspirings to rise are consistent with a generous wish that others may rise also. It is even compatible with a heartfelt satisfaction in its possessor at the progress of others, though they should outstrip him in his upward course. It is the spirit which actuates all true Christians as they wend their way heavenward, rejoicing the more as they find the way is thronged with those who hope to gain an immortal crown.

In the other view of it, we see men actuated by selfishness mingled with pride, inquiring in the spirit of those mentioned in Scripture, "Who among us shall be the greatest?" We everywhere see men violating these sacred injunctions of divine wisdom: "Let no man seek his own, but every man another's wealth." "Let nothing be done through strife or vain-glory; but in lowliness of mind, let each esteem others better than themselves."—"In honour preferring one another."

If such be the true pictures of emulation, in both the good and the bad sense, certainly teachers cannot hesitate a moment as to their duty. They may appeal to the principle first described.—cultivate and strengthen it; and in so doing, they may be sure they are doing a good work. But unless they intend to violate the teachings of common sense, and the higher teachings of Christianity, *we know not how they can appeal to the principle of emulation, as defined in the second case.*

But it may be urged that the teacher will find emulation, even in this latter sense, existing in human nature; that he cannot get rid of it if he will; that it will be one of the most active principles to which he can resort in arousing the mind to exertion; and furthermore, that it has been appealed to by many of the most eminent teachers time out of mind.

To this it is replied, that it is not disputed that children are selfish; and that this selfishness may indeed be made a powerful instrumentality in urging them forward to the attainment of a temporary end. But does the existence of selfishness prove that it needs cultivation in the human character? And will the end, when attained, justify the means? Is the end, whatever it may be, if attained at such a cost, a blessing to be desired? Will not the heart suffer more than the head will gain?

It may be further urged, that the child will find the *world* full of this principle when he leaves the school; and why, it is asked, should he at school be thrown into an unnatural position? We answer, that evil is not to be overcome by making evil more prevalent,—and though there may be too much of self-seeking in the world, that is the very reason why the teacher should not encourage its growth. The more true Christianity prevails in the world, the less there will be of that spirit which rejoices at another's halting; hence we are convinced the teacher should do nothing to make that spirit more prevalent.

Nor is it essential to the progress of the pupil even temporarily, since there are other and worthier principles which can be as successfully called into action. If we look carefully at the *expediency* of thus stimulating the mind, we find that after the first trial of strength many become disheartened and fall behind in despair. It will soon be obvious, in a class of twenty, who are the *few* that will be likely to surpass all others; and therefore all the others as a matter of course fall back into envy, perhaps into hopeless indifference. Who has not seen this in a class in spelling, for instance, where the strife was for the "*head*" of the class, but where all but two or three were quite as well satisfied with being at the "*foot?*" It does not then accomplish the purpose for which it is employed: and since those who are aroused by it, are even more injured than those who are indifferent, their undesirable quali-

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ties being thus strengthened, the opinion is entertained that those teachers are the most wise, who bend their ingenuity to find some other means to awaken the minds of the children under their charge.

From what has been said, then, *Emulation* is to be recognised or repudiated among the incentives of the school-room, according to the signification we assign to the term.

PRIZES.

It has for a long time been the custom of teachers to offer some *prize* as an incentive to exertion in school; a prize of some pecuniary value, a book or a medal. In some places beneficent individuals have bestowed by legacy the means to purchase annually the prizes thus to be used. Every young teacher is called upon, therefore, to inquire whether such an incentive is a proper one to be employed in the school-room. If there is any good to be expected from such an incentive, will it counterbalance the evils that spring from the practice? Will the good of the whole school be promoted by such a measure,—and will this be a permanent or a temporary good? These are questions which press for an honest answer; and the faithful teacher should not shrink from a careful investigation of the whole matter; and if he finds good reason to differ from time-honoured authority, he should abide by the truth rather than by prescriptive usage.

In our own case, we may be allowed to say, our mind was early turned to this point; though we confess with a strong bias in favour of the use of prizes. Pretty thoroughly for a series of years did we test their efficacy, but with a growing conviction, that the prize was *not* the proper instrumentality to create a healthy interest in the school. This conviction acquired additional strength by three or four years' trial of other incentives; and it was fully confirmed afterwards by a trial made for the purpose of testing again the efficacy of a prize, at an age when we could more carefully watch the workings of the human mind, and better appreciate the benefits or evils resulting from such a measure. We are now free to say, that we are satisfied that *prizes offered to a school in such a way that all may compete for them, and only two or three obtain them, will always be productive of evil consequences, far overbalancing any temporary or partial good that may arise from them, and therefore they ought not to be used as incitements in our schools*[*].

Having expressed an opinion so decidedly upon a measure which claims among its friends and advocates some of the best minds of the country, we shall be expected to assign some reasons for the faith we entertain. From this we shall not shrink. We proceed therefore to express such objections to the use of prizes as have been suggested to our mind by our own experience, and confirmed by the experience and observation of others in whom we have great confidence.

I. *The offer of a prize gives undue prominence to a comparatively unworthy object.* It practically teaches the child to undervalue the higher reward of a good conscience, and a love of learning for its own sake. The dazzling medal is placed in the foreground of his field of vision; and it is very likely to eclipse those less showy but more abiding rewards found in a sense of duty and a desire to be qualified for usefulness. In studying his lessons he thinks of the *prize*. He studies that he may merely *recite* well; for it is a good recitation that wins the prize. He thinks not of duty, or of future usefulness; the *prize* outshines all other objects.

II. *The pursuit of a prize engenders a spirit of rivalry among the pupils.* Rivalry in pursuit of an object which only *one* can attain, and which *all others* must lose, must end in exultation on the part of the winner, and disappointment and envy on the part of the losers. It may be said this *ought not to be so*; but seldom can it be said, that *it is not so*. Such is human nature, and such it ever will be. Unpleasant feelings —sometimes concealed, to be sure—but generally expressed in unequivocal terms—grow out of the award of almost every school prize, and sometimes continue to exert their baleful influence through life. Now as long as human nature brings forth unlovely traits almost spontaneously, such direct efforts to cultivate them surely are not called for. It is the part of wisdom, then, to omit such culture and avoid such results, especially when safer means are so accessible.

III. *The hope of gaining the prize stimulates only the few, while the many become indifferent.* This is admitted to be true even by the advocates of the prize system. Let a prize be offered in any class as a reward for the best scholarship, and in a very few days it becomes perfectly obvious to all who the *two* or *three* are that will be likely to outstrip all the others. These two or three will be stimulated to exertion; but the strife is left entirely to them. All others, despairing of success, resolve at once to "let their moderation be known to all men;" and since the prize has been made so prominent an object, they cannot be expected now to look at any thing above and beyond it. Feeling that they are not likely to participate in the honours of the class, they have but little disposition to share in its toils.

This to be sure is not always so. There are some, who, ceasing to strive for the prize, toil for the more substantial blessing, a good education, and in the end come out the best scholars. This is the way indeed most of our strong men are made; for it has long been remarked that the *prize* scholars in our schools, and even in our colleges, do not usually become the most distinguished men. On the other hand, many of them are never heard of after receiving their honours. But, though some of the slower scholars do thus hit upon the true path to eminence, it is not to be set to the credit of the system; they rise in *spite* of the system rather than by virtue of it; while the ultimate failure of the prize scholars is usually directly attributable to the defect of the system; for having been unduly stimulated to study solely with reference to *recitation*, and not with regard to future usefulness, their memories have been developed out of all proportion to the other faculties of their minds; and, though they may have been very good *reciters*, they have no power to become independent *thinkers*. Under different training they might have become strong men.

But to look no further than the school, the remark holds true in general, that prizes *stimulate the few*, and *the many become indifferent* not only to prizes, but to other and better motives. That system of incentives only can be approved, which reaches and influences successfully *all the mind* subjected to its operation.

Nor is this an unimportant consideration. It is not sufficient praise for a teacher that he has a *few* good scholars in his school. Almost any teacher can call out the talent of the active scholars and make them brilliant reciters. The highest merit, however, lies in reaching *all the pupils*, the dull as well as the active, and in making the most of them, or rather in leading them to make the most of themselves. It should be remembered of *every* child, that the present is his *only* opportunity of being a child, and of receiving the training appropriate to childhood; and that teacher who rests satisfied with a system that does not reach the many, while he amuses himself and his visitors with the precocity of a few of his most active scholars, is *recreant to his responsible trust*.

IV. *There is much difficulty in awarding the prize so as to do strict justice to all.* So many things are to be taken into the account in order to determine the excellence of a performance compared with others, that some particulars are very likely to be overlooked. Those who are called to judge of the results often disagree among themselves. The following anecdote will illustrate this. Three literary gentlemen were appointed to select the best from several compositions, presented by a class, who had written them in competition for a gold medal. Each of the gentlemen carefully read the whole number in private, and conscientiously selected the *best* according to his judgment. When they came together to compare results, it was found that each man had selected *the best*, but that no two had selected the same! They carefully read and compared the three, and still each insisted that his original choice was the best. After much debate and considerable delay, one of the parties being obliged to go to his business, relieved

[*] It may be well to remind the reader that we have used the term *Prizes* here in contradistinction from a system of *Rewards*, by which the teacher proposes to give some token of his regard to *every one* who does well,—and the more brilliant success of a few does not necessarily preclude others from participating in the favour according to their merit. Of such a system of Rewards we shall have something to say presently.

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himself from a painful detention, and his friends from a perplexing doubt, by saying he believed the composition he had selected *was the best*, but as he could not stop to claim its rights, he would yield them in favour of the *second best* in the hands of one of his associates. This ended the dispute, and the action in favour of the successful one was declared to be *unanimous!*

This only proves how difficult it is to decide; and in the case just cited, it might well be asked, why should one of these competitors be held up to the multitude to be applauded and admired, and the others sent back to their classes covered with the shame of a failure? What principle of *justice* sanctioned this decision?

Nor is this a solitary instance. It rarely happens that the case is perfectly clear, and there is usually much perplexity about it; and hence one reason why the decision seldom satisfies the friends of the parties either in the school or at home. But other considerations beside the intrinsic merits of the performance are to be taken into account in awarding a prize; as,

1. *A difference in the external facilities which the competitors enjoy for getting the lessons.* One pupil may be the son of poverty and be compelled to labour during all the hours out of school; another may be in easy circumstances, and have nothing to prevent giving undivided attention to study during the whole day. One may be the child of parents who have no power to render assistance by way of explaining a difficult point; while the other may have all his doubts removed at once by parental aid. One may never even be encouraged by a kind word at home; another is constantly urged to effort, and perhaps not allowed to be idle. One may have access to no books but his school manuals; the other may have at his command a large library. This difference in circumstances should be taken into the account; but it never can be fully understood by those who are called to decide.

2. *The improper means which may have been employed to secure the prize.* Ambition when aroused is not always scrupulous of its means. One competitor may be high-minded; may enter the arena determined to succeed by an honourable strife; may resolve to succeed by his own exertions, or to fail rather than bring in any thing which is not the fruit of his own study. Another, regardless of honour or principle, resolves only to *succeed*, whatever it may cost; hesitates not to copy from others if possible, or to apply to a brother in college or some friend in the University to furnish the difficult solution, prepared to order. One young lady spends days and nights in arranging the glowing thoughts for her composition, determined if industry, study, good taste, and a careful application of the rules of rhetoric can effect any thing, that her production shall be *worthy* of a prize. Another, in no way distinguished for scholarship, industry, or honour, writes a careless letter to a married sister in a distant city, invoking her aid. In due time the mail brings an elegant essay. It is copied with sufficient accuracy to be read, and at the examination takes the prize! The fair "*authoress*" stands forth and is flattered before the multitude,—is perhaps made to believe that she is *worthy* of praise; she grasps the golden bauble, and covered with the blushes of modesty, receives the congratulations and caresses of friends, and is afterwards reputed a good scholar. Her competitors meantime become convinced that effort cannot rival *genius;* they are mortified to think they have presumed to enter the arena with native talent, and become disheartened as to any future attempt.

Now where is the justice in all this proceeding? Yet this is not fiction; *it is history!* If such abuses—abuses that might well make an angel weep, revealing, as they do, that woman's heart can be thus sold to deception—are the accompaniments of a prize system, may we not well doubt the utility of that system?

Yet who can know either the different facilities enjoyed by the competitors, or the want of principle in some of them? Who can enter the secret chambers of the mind or the heart, and estimate with any accuracy the just amount of merit in any action? This is God's prerogative; while "man looketh only on the outward appearance." Our inference then is; *A system can hardly be safe which is so uncertain.*

V. *The prize rewards* SUCCESS *not* EFFORT; TALENT, *not* WORTH. Every one knows that in estimating the value and virtue of an action, the motive which prompted it, and the effort it necessarily cost, should be taken into the account. Every one knows, too, that success in study is by no means a criterion by which to judge of the merits of the scholar. Some learn their lessons with great facility and with but little effort; others study long and patiently without any brilliant results. One competitor for a prize may bring results which have cost him midnight toil and the most unremitting perseverance; another with brighter parts, and with but little labour, is able to surpass him, and takes the medal. Now the former *deserves* in a far higher degree the encouragement of the reward; yet it is given to him who has the talent but who lacks the industry. The rule of Scripture which announces that "to whom much is given, of him *shall much be required*," is violated, and he is rewarded for producing but little more than the one to whom *little is given.*

It is often urged by those who advocate a system of prizes and rewards, that *God rewards;* and therefore it is at least justifiable that we should imitate his example. We admit that God, in his government, does reward; but he rewards *effort* rather than *success;* he "looketh upon the heart" as man cannot do, and rewards *worth*, not *talent.* We might, indeed, imitate his example, if we had less frailty and were not so liable to be imposed upon by the outward appearance. God indeed rewards men; but he estimates the secret intention, seeing the inward springs of thought before they find expression in words or actions. He regards the motive, and holds out for the encouragement of the humblest child of earth, who does the best he can, as rich a crown of glory, as he does for those whose outward circumstances, in the eyes of mortals, are more auspicious. When man can as wisely and as righteously bestow his prizes and rewards, there will be far less objection to their use.

VI. *The pupil who studies for a prize as his chief motive, will seldom continue to study when the prize is withdrawn.* This is so obvious as scarcely to need illustration. If it be necessary to add anything to the mere statement of the fact, an appeal to almost universal experience would confirm it. A teacher who has depended upon prizes in a school, finds it very difficult to awaken an interest there when he withdraws the prize. Hence many have, on trying the experiment of abandoning the prize system, become discouraged, and have returned again to the use of prizes, believing them essential to their success. Thus the very argument which shows most clearly their pernicious tendency is made a reason for continuing them. As before hinted, the prize scholars in our academies, and even our colleges, are seldom distinguished men in after-life,—a fact that speaks conclusively on this point. But it can scarcely be necessary to spend words to prove a truth almost self-evident.

VII. *By the prize system, the influence of the good example of some of the best pupils is lost upon the school.* All who have taught, know how important this influence is to the success of the school. It tells with resistless power upon the other scholars, wherever it exists, unless some unworthy motive can be assigned for it. But under the prize system, let a teacher appeal to the example of his best scholars, and the reply is, "Oh, yes, he behaves well, or he studies diligently, but *he is trying to get the prize.*" With this understanding, his example becomes powerless, unless, indeed, there may be a disposition to be *unlike* him in everything. It is believed this is a consideration of considerable importance.

We have thus assigned, at some length, the reasons why we should discountenance, among the incentives of the school, the use of Prizes. As to the use of "*Rewards*," when they are made so numerous that every one who is really deserving may receive one,—and when the basis of their distribution is not talent, not success merely, but good intention and praiseworthy effort,—We have much less to say. As expressions of the teacher's interest in the children, and of his approval of their well-doing, they may serve a good end. Perhaps there is no very strong objection to them in principle; though if the teacher subjects himself to the necessary outlay in the purchase of them, it may become burdensome to him. We may add, however, that we *do not think rewards are necessary to the teacher's success.* We should prefer to do without them. It is possible to produce such a feeling in the school-room, that the approving conscience of the child,

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and the commendatory smile of the teacher, shall be the richest of all rewards. These coms without money and without price, and may always be freely and safely bestowed, wherever there is a good intention exhibited by the child. That is the most healthy state of things where these are most prized. As children whose parents begin early to hire them to do their duty, are seldom ready afterwards to render their cheerful service as an act of filial obligation, whenever the pay is withheld,—so children at school, who have been accustomed to expect a reward, seldom pursue their studies as cheerfully when that expectation is cut off.

LESSONS IN TRIGONOMETRY.—No. IV.

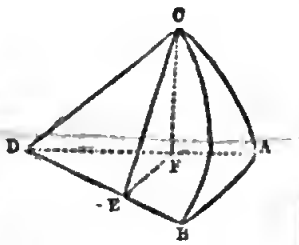
SPHERICAL TRIGONOMETRY.

Spherical Trigonometry teaches how to determine the several parts of a spherical triangle from having certain parts given.

A spherical triangle is a portion of the surface of a sphere, bounded by three arcs of great circles, each of which is less than a semicircle.

RIGHT-ANGLED SPHERICAL TRIANGLES.

Theorem I. *In any right-angled spherical triangle, the sine of the hypothenuse is to radius as the sine of either side is to the sine of the opposite angle.*



Let A B C be a spherical triangle, right-angled at A; then will the sine of the hypothenuse B C be to radius as the sine of the side A C is to the sine of the angle A B C.

Let D be the centre of the sphere; join A D, B D, C D, and draw C E perpendicular to D B, which will, therefore, be the sine of the hypothenuse B C. From the point E draw the straight line E F, in the plane A B D, perpendicular to B D, and join C F. Then, because D B is perpendicular to the two lines C E, E F, it is perpendicular to the plane C E F; and consequently, the plane C E F is perpendicular to the plane A B D. But the plane C A D is also perpendicular to the plane A B D; therefore their line of common section, C F, is perpendicular to the plane A B D; hence, C F D, C F E are right angles, and E F is the sine of the arc A C.

Now, in the right-angled plane triangle E F E,

$$\text{CE} : \text{radius} :: \text{CF} : \text{sine CEF}.$$

But since C E and F E are both at right angles to D B, the angle C E F is equal to the inclination of the planes C B D, A B D; that is, to the spherical angle A B C. Therefore,

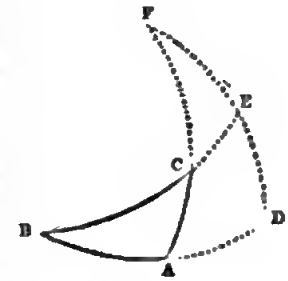
$$\text{sine BC} : \text{R} :: \text{sine AC} : \text{sine ABC}.$$

Cor. 1. In any right-angled spherical triangle, *the sines of the sides are as the sines of the opposite angles.*

For, by the preceding theorem,

$$\begin{aligned} &\text{sine BC} : \text{R} :: \text{sine AC} : \text{sine ABC}, \\ \text{and} \quad &\text{sine BC} : \text{R} :: \text{sine AB} : \text{sine ACB}, \\ \text{therefore,} \quad &\text{sine AC} : \text{sine AB} :: \text{sine ABC} : \text{sine ACB}. \end{aligned}$$

Cor. 2. In any right-angled spherical triangle, *the cosine of either of the sides is to radius as the cosine of the hypothenuse is to the cosine of the other side.*



Let A B C be a spherical triangle, right-angled at A. Describe the circle D E, of which B is the pole, and let it meet the three sides of the triangle A B C produced in D, E and F. Then, because B D and B E are quadrants, the arc D F is perpendicular to B D. And since B A C is a right angle, the arc A F is perpendicular to B D. Hence, the point F, where the arcs F D, F A intersect each other, is the pole of the arc B D, and the arcs F A, F D are quadrants.

Now, in the triangle C B F, right-angled at the point B, according to the preceding theorem, we have,

$$\text{sine CF} : \text{R} :: \text{sine CB} : \text{sine CFB}.$$

But C F is the complement of A C, C B is the complement of B C, and the angle C F B is measured by the arc A D, which is the complement of A B. Therefore, in the triangle A B C, we have,

$$\text{cos. AC} : \text{R} :: \text{cos. BC} : \text{cos. AB}.$$

Cor. 3. In any right-angled spherical triangle, *the cosine of either of the sides is to radius as the cosine of the angle opposite to that side is to the sine of the other angle.*

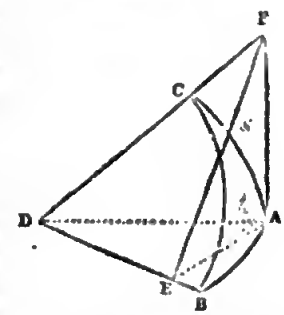
For in the triangle C B F, we have,

$$\text{sine CF} : \text{R} :: \text{sine BF} : \text{sine BCF}.$$

But sine C F is equal to cos. A C, sine B F is equal to cos. A B C, and sine B C F is the same as sine A C B; therefore,

$$\text{cos. AC} : \text{R} :: \text{cos. ABC} : \text{sine ACB}.$$

Theorem II. *In any right-angled spherical triangle, the sine of either of the sides about the right angle is to the cotangent of the adjacent angle as the tangent of the remaining side is to radius.*



Let A B C be a spherical triangle, right-angled at A; then will the sine of the side A B be to the cotangent of the angle A C B as the tangent of the side A C is to radius.

Let D be the centre of the sphere; join A D, B D, C D; draw A E perpendicular to B D, which will, therefore, be the sine of the arc A B. Also, from the point E in the plane B D C, draw the straight line E F perpendicular to B D, meeting D C produced in F, and join A F. Then will A F be perpendicular to the plane A B D, because, as was shown in the preceding theorem, it is the common section of the two planes A D F, A E F, each perpendicular to the plane A D B. Therefore, F A D, F A B are right angles, and A F is the tangent of the arc A C.

Now, in the triangle A E F, right-angled at A, we have,

$$\text{AE} : \text{radius} :: \text{AF} : \text{tang. AEF}.$$

But A B is the sine of the arc A B, A F is the tangent of the arc A C, and the angle A E F is equal to the inclination of the planes C B D, A B D, or to the spherical angle A B C; hence,

$$\text{sine AB} : \text{R} :: \text{tang. AC} : \text{tang. ABC}.$$

And because,

$$\text{R} : \text{cot. ABC} :: \text{tang. ABC} : \text{R};$$

$$\text{therefore, sine AB} : \text{cot. ABC} :: \text{tang. AC} : \text{R}.$$

Cor. 1. In any right-angled spherical triangle, *the cosine of the hypothenuse is to the cotangent of either of the oblique angles as the cotangent of the other oblique angle is to radius.*

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Let A B C be a spherical triangle, right-angled at A. Describe the circle D E F, of which A is the pole, and construct the complemental triangle C E F, as in Cor. 2, Theorem I.

Then, in the triangle O B F, according to the preceding theorem, we have,

$$\text{rad.} : \cot. BC :: \tan. EF : R.$$

But E B is the complement of B C, E F is the complement of E B, the measure of the angle A B C; and the angle B C F is equal to A C B, being its vertical angle; hence,

$$\cos. BC : \cot. ACB :: \cot. ABC : R.$$

Cor. 2. In any right-angled spherical triangle, *the cosine of either of the oblique angles is to the tangent of the adjacent side as the cotangent of the hypothenuse is to radius.*

For in the complemental triangle C E F, according to the preceding theorem, we have,

$$\sin. EF : \cot. CFA :: \tan. OE : R$$

hence, in the triangle A B C,

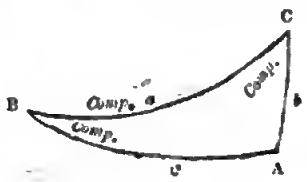
$$\cos. ABC : \tan. AB :: \cot. BC : R.$$

Napier's Rule of the Circular Parts.

The two preceding theorems, with their corollaries, are sufficient for the solution of all cases of right-angled spherical triangles, and a rule was invented by Napier by means of which these principles are easily retained in mind.

If, in a right-angled spherical triangle, we set aside the right angle, and consider only the five remaining parts of the triangle, viz. the three sides and the two oblique angles, then the two sides which contain the right angle, and the complements of the other three, viz. of the two angles and the hypothenuse, are called the *circular parts*.

Thus, in the triangle A B C, right-angled at A, the circular parts are A B, A C, with the complements of B, B C and c.



When, of the five circular parts, any one is taken for the *middle part*, then, of the remaining four, the two which are immediately adjacent to it on the right and left are called the *adjacent parts*; and the other two, each of which is separated from the middle by an adjacent part, are called *opposite parts*.

In every question proposed for solution, three of the circular parts are concerned, two of which are given, and one required; and of these three, the middle part must be such that the other two may be equidistant from it; that is, may be either *both adjacent* or *both opposite parts*. The value of the part required may then be found by the following

RULE OF NAPIER.

The product of the radius and the sine of the middle part is equal to the product of the tangents of the adjacent parts, or to the product of the cosines of the opposite parts.

It will assist the student in remembering the rule to remark, that the first syllable of each of the words *tangent* and *adjacent* contains the same vowel *a*, and the first syllable of the words *cosine* and *opposite* contains the same vowel *o*.

It is obvious that the cosine of the complement of an angle is the sine of that angle, and the tangent of a complement is a cotangent, and vice versa.

In the triangle A B C, if we take the side *b* as the middle part, then the side *c* and the complement of the angle C are the adjacent parts, and the complements of the angle B and of the hypothenuse *a* are the opposite parts. Then, according to Napier's rule,

$$R \sin. b = \tan. c \cot. C,$$

which corresponds with Theorem II.

Also, by Napier's rule,

$$R \sin. b = \sin. a \sin. B,$$

which corresponds with Theorem I.

Making each of the circular parts in succession the middle part, we obtain the ten following equations:

$$R \sin. b = \sin. a \sin. B = \tan. c \cot. C.$$
$$R \sin. c = \sin. a \sin. C = \tan. b \cot. B.$$
$$R \cos. B = \cos. b \sin. C = \cot. a \tan. c.$$
$$R \cos. a = \cos. b \cos. c = \cot. B \cot. C.$$
$$R \cos. C = \cos. c \sin. B = \cot. a \tan. b.$$

In order to determine whether the quantity sought is less or greater than 90°, the algebraic sign of each term should be preserved whenever one of them is negative. If the quantity sought is determined by means of its cosine, tangent or cotangent, the algebraic sign of the result will show whether this quantity is less or greater than 90°; for the cosines, tangents and cotangents are positive in the first quadrant, and negative in the second. But since the sines are positive in both the first and second quadrants, when a quantity is determined by means of its sine, this rule will leave it ambiguous whether the quantity is less or greater than 90°. The ambiguity may, however, be removed by the following rule:

In every right-angled spherical triangle, an oblique angle and its opposite side are always of the same species; that is, both are greater or both less than 90°.

This follows from the equation,

$$R \sin. b = \tan. c \cot. C;$$

where, since sin. *b* is always positive, tan. *c* must always have the same sign as cot. C; that is, the side *a* and the opposite angle C both belong to the same quadrant.

EXAMPLES.

1. In the right-angled spherical triangle A B C, there are given $a = 63° 56'$, and $b = 40°$.

Required the other side *c*, and the angles B and C.



To find the side *c*.

Here the circular parts concerned are the two legs and the complement of the hypothenuse; and it is evident that if the complement of *a* be made the *middle part*, *b* and *c* will be *opposite parts*; hence, by Napier's rule,

$$R \cos. a = \cos. b \cos. c;$$

or, reducing this equation to a proportion,

$$\cos. b : R :: \cos. a : \cos. c = 54° 59' 49''.$$

To find the angle B.

Here *b* is the *middle part*, and the complements of B and *a* are *opposite parts*; hence,

$$R \sin. b = \cos. (\text{comp. } a) \times \cos. (\text{comp. } a) = \sin. a \sin. B,$$
or, $$\sin. a : R :: \sin. b : \sin. B = 45° 41' 25''.$$

B is known to be an acute angle, because its opposite side is less than 90°.

To find the angle C.

Here the complement of C is the *middle part*; also *b* and the complement of *a* are *adjacent parts*; hence,

$$R \cos. C = \cot. a \tan. b,$$
or, $$R : \tan. b :: \cot. a : \cos. C = 65° 45' 57'.$$

Ex. 2. In a right-angled triangle A B C, there are given the hypothenuse $a = 91° 42'$, and the angle $B = 95° 6'$. Required the remaining parts.

To find the angle C.

Make the complement of the hypothenuse the middle part; then, $$R \cos. a = \cot. B \cot. C.$$
Whence, $$C = 71° 36' 47''.$$

To find the side *c*.

Make the complement of the angle B the middle part; and we have, $$R \cos. B = \cot. a \tan. c,$$
Whence, $$c = 71°.32' 14''.$$

To find the side b.

Make the side b the middle part; then,

$$\text{R sin } b = \sin. a \sin. \text{B}.$$

Whence, $b = 95° 22' 30''$.

b is known to be greater than a quadrant, because its opposite angle is obtuse.

Ex. 3. In the right-angled triangle A B C, the side b is 26° 4′, and its opposite angle B 36°. Required the remaining parts.

Ans. $\begin{cases} a = 48° 22' 52'', \text{ or } 131° 37' 8''. \\ c = 42° 19' 17'', \text{ or } 137° 40' 43''. \\ \text{C} = 64° 14' 26'', \text{ or } 115° 45' 34''. \end{cases}$

Ex. 4. In the right-angled spherical triangle A B C, there are given the side c, 54° 30′, and its adjacent angle B, 44° 50′. Required the remaining parts.

Ans. $\begin{cases} \text{C} = 65° 49' 53''. \\ a = 63° 10' 4''. \\ b = 38° 59' 11''. \end{cases}$

Ex. 5. In the right-angled spherical trangle A B C, the side b is 55° 28′, and the side c 63° 15′. Required the remaining parts.

Ans. $\begin{cases} a = 75° 13' 2''. \\ \text{B} = 58° 25' 47''. \\ \text{C} = 67° 27' 1''. \end{cases}$

Ex. 6. In the right-angled spherical triangle A B C, there are given the angle B = 59° 20′, and the angle C = 58° 15′. Required the remaining parts.

Ans. $\begin{cases} a = 76° 30' 37''. \\ b = 65° 28' 58''. \\ c = 55° 47' 45''. \end{cases}$

A triangle, in which one of the sides is equal to a quadrant, may be solved upon the same principles as right-angled triangles, for its polar triangle will contain a right angle.

Ex. 7. In the spherical triangle A B C, the side B C = 90°, the angle C = 42° 10′, and the angle A = 115° 20′. Required the remaining parts.

Taking the supplements of the given parts, we shall have in the polar triangle the hypothenuse $a' = 180° - 115° 20' = 64° 40'$, and one of the sides, $c = 180° - 42° 10' = 137° 50'$, from which by Napier's rule, we find,

$$\text{B} = 116° 23' 20''.$$
$$c' = 132° 2' 13''.$$
$$b' = 125° 15' 36''.$$

Hence the parts of the required triangle are,

$$\text{A C} = 64° 36' 40''.$$
$$\text{A B} = 47° 57' 47''.$$
$$\text{B} = 54° 44' 24''.$$

Ex. 8. In the spherical triangle A B C, the side A C = 90°, the angle C = 69° 13′ 46″, and the angle A = 72° 12′ 4″. Required the remaining parts.

Ans. $\begin{cases} \text{A B} = 70° 8' 39''. \\ \text{B C} = 73° 17' 29''. \\ \text{B} = 95° 13' 23''. \end{cases}$

LESSONS IN ITALIAN GRAMMAR.—No. LI.

SYNTAX.—*Continued.*

OF PERSONAL PRONOUNS.

Rule 36.—When the personal pronouns *io, tu, noi, voi,* are the subjects of a discourse, they may be left out; but *egli, ella, eglino, elleno, esso, essa, essi, esse,* must be expressed, in order to distinguish the gender.

Examples.

Mangio una pernice, I am eating a partridge
Parli da sciocco, thou speakest like a fool
Spendemmo assai, we expended much
Non ragionerete mai, you will never reason
Egli affettò troppa indifferenza, he affected too much indifference
Elleno compirono il voto, they performed the vow

Examples to illustrate the position of Personal Pronoune.

Pensate a me, think of me
Pensa per te, think for you
E' malcontento di se, he is not satisfied with himself
Andate con lui, go with him
Parlate a lei or *ad essa,* speak to her
Egli parla di noi, he speaks of us
Ciò dipende da voi, that depends upon you
Ho bisogno di loro or *di essi,* I have need of them
Vanno con loro or *con esse,* they go with them
Voi insegnate loro, you teach them
Io lo vedo, I see it
Voi l' accusate, you accuse her
Tu la conosci, thou knowest her
Voi l' amate, you love her
Noi li vediamo, we see them
Io le aspetto, I expect them
Voi ne riderete, you will laugh at it
Io ci or *vi penso,* I am thinking of it
Io glielo dirò, I will tell it to him
~~*Voi gliele darete,* you will give~~ it to him
Io glieli manderò, I shall send them to him
Voi gliene comprerete, you shall buy some for him
Tu me lo dai, thou givest it to me
Io te la do, I give it to thee
Egli se li farà dare, he will have them given to him
Noi ce ne occupiamo, we will think of it
Io ve le presto, I lend them to you
Domandegli, ask him
Divertiamoci, let us amuse ourselves
Domandategliele, ask it of him
Datemene, give me some
Non gliele domandate, do not ask it of him
Non me ne date, do not give me some
Non le facciamo, let us not do it
Ciò mi piace, that pleases me
Dio ti vede, God sees you
Egli si lusinga, he flatters himself
Noi ci vediamo, we see one another
Io vi amo, I love you
Rispondetemi, answer me
Vi prego di parlargliene, I pray you to speak to him about it
Promette loro, I promise them
Ne parlerò loro, I will speak to them about it
Datene loro, give them some
Eccomi, here I am
Eccoti, here thou art
Eccolo, here it is
Eccoli, here they are
Eccoci, here we are
Eccovi, here you are

ITALIAN FORMS OF ADDRESSING PERSONS.

The Italians, in speaking or writing to persons of both sexes, whom they wish to treat with great respect, make use of the title *Vossignoria,** or *Vostra Signoria,* your lordship or ladyship. As this flattering title is in the third person of the feminine gender, it requires the verb in the third person, and agrees with the adjective or past participle.

To avoid the repetition, or better to avoid the word *vossignoria,* the Italians make use of *ella,* as it is seen in the following illustration:—

Singular—for both Genders.

N.	*Vossignoria, V. S.,* or *ella,* you	(Sir or Madam)
G.	*Di vossignoria, V. S.,* or *di lei,* of you	
D.	*A vossignoria, V. S.,* or *a lei* or *le,* to you	
Ac.	*Vossignoria, V. S.,* or *lei* or *la,* you	
Abl.	*Da vossignoria, V. S.,* or *da lei,* from you	

Plural.

	Masculine.	Feminine.
N.	*Lor signori,*	*lor signore,* you
G.	*Di lor signori,*	*di lor signore,* of you
D.	*A lor signori,*	*a lor signore,* to you
Ac.	*Lor signori,*	*lor signore,* you
Abl.	*Da lor signori,*	*da lor signore,* from you

* This word is seldom used in polite societies.

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Masculine and Feminine.

N. *Le signorie loro*, or *ellene*, you
G. *Delle signorie loro*, or *di loro*, of you
D. *Alle signorie loro*, or *a loro*, to you
Ac. *Le signorie loro*, or *loro*, *le*, you
Abl. *Dalle signorie loro*, or *da loro*, from you

Examples.

Ella mi disse che era soddisfotta, you told me that you were satisfied
Ella è molto dotta, you are very learned
Come sta V. S. or *ella?* how do you do, sir, or madam?
In ringrazio V. S. or *lei*, or, *io la ringrazio*, I thank you, sir, or madam
Io diedi un libro a V. S. or *a lei*, or, *io le diedi un libro*, sir, or madam, I gave you a book
Come stanno le V. S., or *lor signori*, or *ellene?* how do you do, gentlemen or ladies?
Io vidi le V. signorie all' opera, or *io le vidi all' opera*, or *io eidi lor signori all' opera*, or *io li vidi all' opera*, gentlemen, or ladies, I saw you at the opera
E ella stato in campagna? have you been in the country, sir, or madam?
Sono ellene stato in campagna? have you been in the country, gentlemen and ladies?
Sono lor signori stati in campagna? have you been in the country, gentlemen?
Dove è il suo fratello, or *dove è il fratello di V. S.?* where is your brother, sir, or madam?
Ho veduta le sue sorelle, I saw your sisters, sir, or madam
Hanno le vostre signorie ricevuta il loro denaro? have you received your money, gentlemen, or ladies?

Masters speaking to their servants, or other persons of the lower orders; parents to their children; husbands to their wives; brothers, sisters, cousins, intimate friends, to each other, all make use of the second person singular. Poets, and people in a passion, do not fail to employ it.

The Italians, enemies to affectation or adulation, have always preferred to use the second person plural, instead of the second person singular. This opinion is highly approved in several parts of Italy.

OF POSSESSIVE PRONOUNS.

Rule 37.—The Possessive Pronouns are generally preceded by the definite article *il*, *lo*, or *la*.

Examples.

Il mio fazzoletto e la mia scatola, my handkerchief and snuff-box
Il tuo cappello e la tua parrucca, your hat and wig
Il suo padre e la sua madre, his father and mother
I nostri prati e le nostre vigne, our meadows and vines
I suoi fratelli e le sue sorelle, his brothers and sisters

Rule 38.—The possessive pronouns must agree in gender and number with their substantives.

Examples.

Il mio libro ed il vostro, my book and yours
La vostra opinione e la mia, your opinion and mine
I nostri amici ricusarono le nostre mercanzie, our friend refused our goods
Esse non hanno parlato se non del mio cane e della loro gatta, they have spoken only of my dog and their cat
Il padre ama sua figlia, e la madre suo figlio, the father loves his daughter, and the mother her son

Rule 39.—The possessive pronouns may be put either before or after the substantives with which they agree.

Examples.

Egli ha scritto al suo amico, he has written to his friend
Letta la vostra lettera, entrò nelle sue camere, after having read your letter, he entered into his apartment
Io attendo ai fatti miei, I mind my own business
Egli va satollando la fame a spese mie, he satisfies his hunger at my expense
Hai guastato i fatti tuoi, you have spoiled your affairs

Rule 40.—The possessive pronouns preceded by *ogni*, *qualche*, *alcuno*, *molto*, *questo*, *quello*, *cuegli*, *uno*, *due*, *tre*, have no article.

Examples.

Ogni mio ufficio verso te è fornito, all my kind offices towards thee are at an end
Per consiglio di qualche suo amico, by the advice of some of his friends
Gli uomini sono delle femmine capo, e senza l' ordine loro, rade volte riesce alcuna nostra opera a lauderol fine, man is the head of a woman, and without his management, it seldom happens that any undertaking of ours succeeds
Ella con questo suo figliuolo sen' andava in contado, she used to go to the country with her son
Lasciò erede un suo figliulo, he left an only son all his fortune

The possessive pronouns preceded by prepositions take no article in the following expressions:—

In mia, tua, sua, vita, in my, thy, his, life
In mio, tuo, poter, in my, thy, power
In favor mia, in my favour
In presenza mia, in my presence
In casa mia, in my house
Per mio consiglio, by my advice
Per amor mio, for my sake
Per mia, sua, difesa, for my, his, defence
Per nostro bene, for our good
Per parte mia, or *da parte mia*, from me

Rule 41.—No article generally precedes the possessive pronouns, when the latter are prefixed to substantives which express—1st. Kindred or relation, such as *padre*, *madre*, *figlio*, *sorella*, *marito*, etc. 2ndly. The rank and quality, such as *altezza*, *eccellenza*, *maestà*, etc.

Examples.

Chi è vostro padre? who is your father?
Mia madre, un fratello minore, ed io, siamo restati nell' estrema miseria, my mother, a younger brother, and myself, have been left in great distress
Egli adunque inteso il nobile atto di Filippo usato a salute di suo marito, he then having heard of the noble action of Philip in favour of her husband
Venne sua Maestà accompagnata dal Duca d' Orleano, his Majesty was accompanied by the Duke of Orleans
Sua Eccellenza le baciò la mano, his Excellency kissed her hand

Rule 42.—When the possessive pronouns follow the above substantives, *padre*, *madre*, etc., or precede the same in the plural, then the article is used.

Examples.

Ho veduto la sorella vostra, I have seen your sister
La madre mia è partita, my mother is set out
Mi ricordo aver udita dire al padre mio, I recollect I heard my father say
Finchè io posso farlo in persona, soffra la maestrà vostra, as long as I can do it myself, allow me, sire
Prima che io ringrazio le loro signorie, before I thank you lordships

Rule 43.—Speaking of any part of the body, whole, sick, or wounded, instead of the English possessive pronouns, the Italians use *il*, *lo*, *la*.

Examples.

Lavatevi le mani, wash your hands
Mi fate male al dito, you hurt my finger
Gli hanno tagliato la testa, they cut off his head
Essi si graffiarono il viso, they scratched their own faces
Egli ha perduto lo spirito, he has lost his senses

OF DEMONSTRATIVE PRONOUNS.

Rule 44.—The Demonstrative Pronouns *questo*, *quello* and *costui*, used to show the proximity or distance of persons or things, must agree with their substantives in gender and number.

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Examples.

E' capitato quest' oggi, he has arrived this very day
Quando arriverà quel giorno sospirato? when will that day come so much desired?
Preferisco questa camera a quella, I prefer this room to that one
Quelle donne sono graziose, those ladies are graceful
Questi mercanti sono ricchissimi, these are very rich merchants

Rule 45.—The demonstrative pronouns—he who, she who, they who, are expressed by *colui che* or *chi*, *colei che*, *quelli che*, *quelle che*, and—that which, or what, by *ciò che*.

Examples.

Colui che or *chi tradisce l' amico suo è indegno d' amicizia*, he who betrays his friend is unworthy of friendship
Colei che or *chi voi amate è un' amabile damina*, she whom you love is a charming young lady
Coloro che sembrano felici non sono sempre tali, they who seem to be happy are not always so
Ciò che più mi piace è la campagna, that which pleases me most is the country
Ciò che mi piace più nella nazione Inglese, è la loro parola d' onore, what pleases me most in the English nation, is their word of honour

OF RELATIVE PRONOUNS.

Rule 46.—The Relative Pronoun, who, that, or which, is expressed in Italian by *che*, when it is the subject or regimen direct of a verb, or by *di cui*, *a cui*, *da cui*, when used in the genitive, dative, or ablative cases.

Examples.

L' uomo che vi parlò ieri, è il padrone di questa casa, the man who spoke to you yesterday, is the master of this house
Il pane che mangiate, the bread that you eat
Ecco la persona che amate, there is the person you love
Dio di cui ammirasi l' opere, God whose works we admire
La cosa a cui meno pensa l' avaro, è di sovvenire i miseri, the thing of which the miser thinks the least, is to help the poor

Rule 47.—The relative pronoun *quale*, used for persons or things, is declined with the article *il* or *la*, and agrees with its antecedent in gender and number.

Examples.

Ho veduto questa mane il ritratto di quella dama, il quale vi piace tanto, I saw this morning the portrait of that lady, which pleases you so much
La casa della quale ha fatto acquisto, the house which I have bought
Ecco è l' uomo al quale sono più obbligato, he is the man I am the most indebted to
Le scienze alle quali io mi applico, the sciences to which I apply myself
Vi sono uomini i quali nascono buoni, there are men who are born good

OF INTERROGATIVE PRONOUNS.

Rule 48.—*Chi?* meaning "who?" is used in speaking of persons of both genders and numbers.

Examples.

Chi è là? who is there?
Chi siete voi? who are you?
Chi è vostro fratello? who is your brother?
Di chi parlate? of whom do you speak?
Chi son costoro? who are those?

Rule 49.—*Che?* signifying "what?" is used in speaking of things.

Examples.

Che ora è? what time is it?
Che volete? what do you want?
Che intendete di fare? what do you mean to do?
Che età avete? what is your age?
Che nuove abbiamo? what is the news?

Rule 50.—*Quale?* signifying "what?" is always joined to a substantive, and used in speaking of men or things of both genders.

Examples.

Qual bisogno avete? what need have you?
Di qual principe leggete voi l' istoria? of what prince do you read the history?
Quale amore, qual ricchezza, qual parentado avrebbe i sospiri di Tito con tanta efficacia fatti a Gisippo nel cuor sentire, se non costei? what degree of love, wealth, affinity, could have wrought so effectually upon the heart of Gysippus, to make him feel the pangs of Titus, but this (friendship)?
Quali affari avete? what business have you?
A qual casa appartiene? which house does it belong to?

LESSONS IN SPANISH.—XXI.

IDIOMATIC USE OF CERTAIN VERBS.

Volver á, to return, to repeat, is used before an infinitive when it is required to repeat the action denoted by the infinitive, in which case the adverb "again" would be used in English, and the infinitive be rendered in the same tense as *volver*; as,

Volví á verle, I saw him again (literally, I returned to see him).
*Volvió á escribir la carta** he re-wrote (or wrote again) the letter.

Acaber de, to finish from, is used before an infinitive in the sense of "to have just," and the infinitive is rendered in English as a past participle; as,

Juan acaba de llegar, John has just arrived.
Acabo de verla, I have just seen him.

Estar para, to be towards, is used before an infinitive in the sense of to be ready, or, to be about to; as,

Estaban para acabar sus estudios, they were about to finish their studies.

Estar por, to be for, is used before an infinitive to show that the action implied in this infinitive is not yet performed, but that there is a disposition to accomplish it; that is, in the sense of, to be not yet, or, to have a mind to; as,

La casa está por acabar, the house is to finish, *i.e.* the house is not yet finished.
Estoy por ir á verla, I am for going (or have a mind to go) to see him.

Quedar por, to remain for, is used before an infinitive in the same manner as *estar por*, in the sense of, to remain yet; as,

La carta queda por escribir, the letter remains yet to write (remains to be written).

Haber de, to have of, is used before an infinitive in the sense of, to be to, or must; as,

No han de hacer uso de ellos, they are not to (must not) make use of them.
He de trabajar, I am to (I must) work (or, I have to work).

Tener que, to have what, is used before an infinitive in the sense of, to have to, or must; as,

Tiene que levantarse al romper del dia, he has to rise by break of day.

Llegar á, to arrive at, is used before an infinitive in the sense of, to come to, or, to succeed in; as,

Cuando el hombre llega á gustar los encantos de la virtud, la prefiere al vicio, when man comes to taste the delights of virtue, he prefers it to vice.

* Literally, "he returned (or repeated) to write the letter." It must be kept in mind that this is the usual mode in Spanish for expressing the repetition of an action, instead of using a word corresponding to "again" in English.

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Venir á, to come to, is used as *llegar á*, in the sense of, to come to; as,

Los dones vienen á ser perjudiciales, gifts come to be injurious.

Tener is used with the noun in such expressions as, to be hot, cold, hungry, thirsty, afraid, ashamed; thus, to have heat, to have hunger, to have fear, etc.; which in English must be rendered by the verb to be and the correspon ding adjectives; as,

Tiene hambre, he-is hungry. | *Tiene temor*, he-is afreid.

Hacer is used impersonally before nouns referring to the weather, and is to be rendered by the verb to be, and sometimes with the adjective; as,

Hace calor, it-is hot. | *Hace buen tiempo*, it-is fair weather.

Tener is used in the sense of to be, before nouns of measurement, with the preposition *de* in the sense of in; as,

Goliath tenia de altura seis codos y un palmo, Goliath was in height six cubits and a span.

Gustar, when it is to be rendered in English by to like, has for its nominative case in Spanish what is the objective in English, and its objective in Spanish is the nominative in English, preceded by the preposition *á*, the sentence generally containing what in English would be regarded as a redundant pronoun; as,

¿ Le gustan á vmd. patatas ? do you like potatoes? | *Ella me gusta á mí*, I like her.

These sentences, rendered more literally, mean, "do potatoes please (or suit) you?" "she pleases me."

Faltar, when it is to be rendered in English by, to want, or to have need of, requires the same idiomatic construction of the sentence as *gustar*; as,

A Pedro no le falta dinero, Peter wants (or needs) not money. | *Le faltan tres vasos*, he wants (or needs) three tumblers.

Rendered more literally, these examples mean, "to Peter money is not wanting," "three tumblers are wanting to (or needed by) him."

Hacer falta, to make need, is used in the same manner as *gustar* and *faltar*, in the sense of, to have need of, to stand in need of; as,

Me hace mucha falta el consejo de vmd., I stand in much need of your advice.

More literally rendered, this example would be, "the advice of your-worship makes much need to (is much needed by) me."

Pesar, when it is to be rendered in English by, to repent of, to be sorry for, is subject to the same peculiarity of construction as *gustar* and *faltar*, except that it is used before an infinitive with the preposition *de*, which infinitive would in English be used as a participle; as,

A Dios le pesa de haber hecho rey á Saul, God repents of having made Saul king.

"It-repents God for having made Saul a king," would be a more literal rendering of this last example.

OF THE ADVERB.

Adverbs are either derivative (or primitive), or adverbial phrases.

The simple adverb, when it qualifies a verb, generally comes after the verb; as,

La religion expresa sublimemente esta verdad, religion expresses this truth sublimely.

There can be no regular rules given for the position of the adverb; in most instances it may vary according to the taste of the writer. Some adverbs generally precede the verb; such are, *cuando*, when; *luego*, immediately; *apenas*, scarcely; *cuanto*, as much; *donde*, where; and negative and interrogative adverbs.

The adverb, when it qualifies an adjective or another adverb, generally comes before the word it qualifies; as,

Ella es muy ignorante, she is very ignorant. | *He obrado muy necíamente*, I-have acted very foolishly.

Adverbs, like adjectives, admit of comparison; as,

Alaban mas á los muertos que á los vivos, they-praise more the dead than the living. | *Reciben mas alegremente que dan*, they-receive more gladly than they-give.

The adverb *no* is sometimes used in comparisons in a manner that does not imply a negation, in which case it would be redundant in English, and might be properly omitted in Spanish; as,

Mejor es el buen nombre que no las riquezas, better is the good name than the riches.

Muy, very, very much, is used to qualify adjectives, participles, and other adverbs, but is never used to modify verbs. *Mucho*, much, very much, is used to qualify verbs and sometimes adverbs of comparison; as,

Ella es muy rica, she is very rich. | *Es necesario estimarle mucho*, it-is necessary to esteem him much.

Lucía lee muy bien, Lucy reads very well. | *Tu has hecho mucho mas poderoso que nosotros*, thou-hast made thyself much more mighty than we.

Para amar mucho al hombre, preciso es estimarle mucho, in-order to-love a man

Muy sometimes is employed to qualify nouns, especially at the beginning of a note or letter addressed to any person; as,

Muy amigo mio, very much my friend (dear friend). | *Muy señor mio*, very much my gentleman (dear sir).

Muy caballero, very much a gentleman (dear sir). | *Muy señora mia*, very much my lady (dear madam).

Bien, joined to adjectives or adverbs, is equivalent to very; as, *bien rico*, very rich; and to verbs, much; as, *él bebió bien*, he drank much.

Negative adverbs and all negations generally precede the verb; as,

No puede escribir, he-cannot write. | *A ninguno dió el libro*, to no-one gave-he the book.

If a word implying negation come after the verb, the adverb *no* must precede the verb; as,

No dió el libro á ninguno, he-gave the book to no-one. | *No tiene nada*, he-has nothing.

From the last two rules it will be seen that, in Spanish, it can be said, *nada tiene*, or *no tiene nada*, he-has nothing; *á ninguno habló*, or *no habló á ninguno*, he-spoke to nobody; *ella nunca ha hablado*, or *ella no ha hablado nunca*, she has never spoken.

Nunca, never, and *jamas*, never, are sometimes both used in a sentence to give additional force to the negation; as,

Nunca jamas tendrá sed, never, never will-he-be thirsty.

Jamas, never, is used with *siempre*, always, in the sense of ever and ever; as,

Dios reina por siempre jamas, God reigns for ever and ever.

In interrogative sentences, *jamas* is rendered by ever in English; as, *¿ ha jamas hablado ?* has he ever spoken?

Si, yes, and *no*, no, when used after verbs in such sentences as, he replied no, they answered yes, I believe not, take *que* before them in Spanish: as,

Me dijeron que no, they-told me no. | *Respondió que si*, he replied yes.

Creo que no, I-think not.

Si, yes, and *no*, no, serve to affirm or deny what is predicated in a preceding verb without repeating the verb; as,

Yo no sé nadar, y Juan si, I know not how to swim and John does (yes). | *Ella puede cantar, pero yo no*, she can sing but I cannot (no).

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Derivative adverbs are nearly all formed from adjectives, by suffixing *mente*, which in Spanish corresponds to *ly* added to adjectives in English; as,

Cierto; ciértaménte, certain; certainly.	*Bastante; bastánteménte*, sufficient; sufficiently.

When more adverbs than one ending with *mente* qualify the same verb, the suffix *mente*, for the purpose of preventing a disagreeable repetition of sound, is placed to the last adverb only; as,

Mi ánimo es explicar lisa y llanaménte, my intention is to explain clearly and plainly.

It would not be more correct to say in Spanish *explicar lisaménte y llanaménte*, than it would to say in English (what the Spanish idiom literally requires), to explain clear and plainly.

Two or more words used in connexion to qualify a verb or adjective, are called an adverbial phrase or adverbial locution: such are *por cierto*, for certain; *á lo ménos*, at least; *por lo comun*, in general.

In all languages there are certain phrases used adverbially, the words of which, taken collectively, have an idiomatic meaning, but taken separately, would make no sense. Thus in English the adverbial locutions "by and by," "at least," "none at all," would signify nothing intelligible if taken literally, word by word; but as adverbial phrases, they are very expressive. It is often thus in Spanish: a mere literal translation of the words will do little or nothing toward assisting us to comprehend the meaning. Such phrases will generally be found explained in their adverbial sense in dictionaries. Some of the most common are given in the following list:—

A conciéncia, conscientiously.
A la verdad, truly.
A vista de ojos, evidently; at a glance.
A sabiendas, knowingly.
Al seguro, securely.
A' buen seguro, certainly.
Antes con ántes, as soon as possible.
Ahora, ahora, just now.
A cuestas, on one's shoulder or back.
A porfía, emulously.
A gatas, on all fours.
A coces, by dint of kicking, by kicks.
A mas correr, with the utmost speed.
A mas tardar, after great delay.
A lo improvista, unexpectedly.
A trechos, at intervals.
A una, together; in company.
A la continua, continually.
A hecho, indiscriminately.
Al paso que, in proportion as.
A pié, on foot.
A buen hora, early; seasonably.
A la hora, at the nick of time.
Algun tiempo hace, some time since.
Al revés, wrong side outwards; on the contrary way.
A mas no poder, with all one's might.
A lo sordina, noiselessly; slyly.
A escondidas, or, *a escondidillas*, secretly, stealthily.
Al buen punto, pointedly; opportunely.
A saltos y corcovos, by fits and starts.
A la corta ó á la larga, sooner or later.
A ojos cerrados, without reflection; rashly.
Al ojo, at sight.
Al punto, instantly.
A tientas, in a groping manner.
A mas tirar, to the utmost.
A tuerto ó á derecho, right or wrong; hit or miss.
A secas y sin llover, without preparation or advice.
A solas, by one's self; in private.
A buena luz, carefully; with due examination.
A dos luces, ambiguously.
A trompa y talega, helter-skelter; confusedly.
Bajo mano, in an underhanded manner.
Bien como, just as.
Casi casi, very nearly.
Cuanto ántes, as soon as possible.
Cuanto tiempo, how long.
Cuando ménos, at least.
Cuando mucho, at most.
De contado, readily; immediately.
De seguro, of course.
De cuando en cuando, from time to time; now and then.
De improviso, unexpectedly; on a sudden.
De aquí para allí, to and fro, here and there.
De ántes, of old; of yore.
De continuo, continually.
De intento, purposely.
De proposito, on purpose.
De hecho, in fact; actually.
De noche, by night.
De dia, by day.
De salto, suddenly.
De por sí, by one's self; apart.
De silla á silla, face to face.
De tropel, in confusion; pell-mell.
De lance, cheaply; second-hand.
De repente, secondly.
De rodillas, on one's knees.
De consiguiente, consequently.
De véras; de verdad, truly.
En conciéncia, in good earnest.
En especial, especially.
En seguida, afterward.
En tanto, or, *entre tanto*, in the mean time; whilst.
En alguna parte, somewhere.
En ninguna parte, nowhere.
En otra parte, elsewhere.
En alguna otra parte, somewhere else.
En ninguna otra parte, nowhere else.
En cualquiera parte, any where.
En adelante, forward; in the future.
En lo sucesivo, afterward; hereafter.
El año que viene, next year.
En derechura, by the most direct way.
En piernas, bare-legged.
En resúmen, in short; briefly.
Hasta no mas, to the highest pitch.
Hasta que, as far as.
Hoy dia, or, *hoy en dia*, now-a-days.
Hoy por hoy, this very day.
La semana pasada, last week.
La semana que viene, next week.
Mucho tiempo há, long time ago.
Mañana á la noche, to-morrow night.
Ni bien, no sooner; scarcely.
No mucho há, not long since; a short time ago.
Por atras, behind.
Poco há, of late; lately.
Poco á poco, by degrees.
Por el tanto, on that ground; for the reason.
Por entónces, at that time.
Por supuesto, of course.
Por puntos, from one moment to another.
Por salto, on a sudden.
Por lo largo, along.
Por razon, consequently.
Por fin, finally.
Por instantes, incessantly.
Por poco, but little; nearly
Por acá ó por allá, here or there.
Por encima, superficially.
Pocas veces, seldom.
Rara vez, not often; seldom.
Rato há, short time ago.
Sin suelo, without bounds; to excess.
Sobre seguro, confidently; securely.
Sin ton y sin son, without rhyme or reason.
Sobre manera, excessively.
Sobre sí, separately; selfishly.
Tal vez, perhaps; once at a time.
Una vez, once.
Ya há rato, some time ago.

Very few adverbial phrases can be literally translated from one language to another so as to give a correct idea of their meaning: thus, of those in the above list, *á mas correr* literally means, to more to run; *algun tiempo hace*, some time it makes; *á mas no poder*, to more not to be able; *de cuando en cuando*, of when in when; *en lo sucesivo*, in that which is successive. Occasionally each a phrase may be found of which a literal translation will furnish a sufficient explanation of its meaning; as, *en alguna otra parte*, in some other part; *en ninguna parte*, in no part; *la semana pasada*, the week past; *la semana que viene*, the week which comes; *pocas veces*, few times.

Adverbs are variously classified according to their signification, as follows:

1. Adverbs of time; present, past, future, and indefinite.
 Adverbs of time present; as, *ahora*, now; *hoy*, to-day.
 Adverbs of time past; as, *ayer*, yesterday; *entónces*, then.
 Adverbs of time future; as, *mañana*, to-morrow.
 Adverbs of time indefinite; as, *cuando*, when; *siempre*, always; *temprano*, early.

2. Adverbs of place; in a place, to a place, toward a place, and from a place.
 In a place; as, *donde*, where; *aquí*, here; *allá*, yonder; *dentro*, within.
 To a place; as, *¿ adonde ?* whither? *acá*, hither.
 Toward a place; as, *¿ hácia donde?* whitherward?
 From a place; as, *de allí*, thence; *de donde*, whence.

3. Adverbs of order; as, *primero*, first; *finalmente*, finally.

4. Adverbs of quality; as, *confusamente*, confusedly; *bien*, well.

5. Adverbs of quantity; as, *poco*, little; *bastánteménte*, sufficiently.

6. Adverbs of affirmation and certainty; as, *sí*, yes; *ciertamente*, certainly.

7. Adverbs of negation and uncertainty; as, *no*, no; *dudosamente*, doubtfully; *acaso, quizá*, perhaps.

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LESSONS IN READING AND ELOCUTION.

No. XXVIII.

GOD, THE CREATOR.

Cast your eyes upon the earth that supports us; raise them then to this immense canopy of the heavens that surrounds us,—these fathomless abysses of air and water, and these countless stars that give us light. Who is it that has suspended this globe of earth? who has laid its foundations? If it were harder, its bosom could not be laid open by man for cultivation; if it were less firm, it could not support the weight of his footsteps. From it proceed the most precious things: this earth, so mean and unformed, is transformed into thousands of beautiful objects that delight our eyes. In the course of one year, it becomes branches, buds, leaves, flowers, fruits, and seeds; thus renewing its bountiful favours to man. Nothing exhausts it. After yielding, for so many ages, its treasures, it experiences no decay; it does not grow old; it still pours forth riches from its bosom.

Who has stretched over our heads this vast and glorious arch? What sublime objects are there! An all-powerful Hand has presented this grand spectacle to our vision.

What does the regular succession of day and night teach us? The sun has never omitted, for so many ages, to shed his blessing upon us. The dawn never fails to announce the day; and "the sun," says the Holy Book, "knows his going down." Thus it enlightens alternately both sides of the world, and sheds its rays on all. Day is the time for society and employment. Night folds the world in darkness, finishes our labours, and softens our troubles. It suspends, it calms everything. It sheds round us silence and sleep; it rests our bodies, it revives our spirits. Then day returns, and recalls man to labour, and reanimates all nature.

But besides the constant course of the sun, that produces day and night, during six months it approaches one pole, and during the other six, the opposite one. By this beautiful order one sun answers for the whole world. If the sun, at the same distance, were larger, it would light the whole world, but it would consume it with its heat. If it were smaller, the earth would be all ice, and could not be inhabited by men.

What compass has been stretched from heaven to earth and taken such just measurements? The changes of the sun make the variety of the seasons, which we find so delightful.

The Hand that guides this glorious work must be as skilful as it is powerful, to have made it so simple, yet so effectual; so constant and so beneficent.—*Fenelon.*

THE URSA MAJOR.

With what a stately and majestic step
That glorious Constellation of the North
Treads its eternal circle! going forth
Its princely way amongst the stars in slow
And silent brightness. Mighty one, all hail!
I joy to see thee on thy glowing path
Walk, like some stout and girded giant,—stern,
Unwearied, resolute, whose toiling foot
Disdains to loiter on its destined way.

The other tribes forsake their midnight track,
And rest their weary orbs beneath the wave.
But thou dost never close thy burning eye,
Nor stay thy steadfast step. But on, still on,
While systems change, and suns retire, and worlds
Slumber and wake, thy ceaseless march proceeds.
The near horizon tempts to rest in vain.
Thou, faithful Sentinel, dost never quit
Thy long appointed watch; but, sleepless still,
Dost guard the fixed light of the universe,
And bid the North for ever know its place.

Ages have witnessed thy devoted trust,
Unchanged, unchanging. When the sons of God
Sent forth that shout of joy, which rang through heaven,
And echoed from the outer spheres that bound
The illimitable universe,—thy voice
Joined the high chorus; from thy radiant orbs
The glad cry sounded, swelling to His praise
Who thus had cast another sparkling gem,
Little but beautiful, amid the crowd
Of splendours that enrich his firmament.
As thou art now, so wast thou then, the same.

Ages have rolled their course, and time grown grey;
The earth has gathered to her womb again,
And yet again, the myriads that were born
Of her,—uncounted, unremembered tribes.
The seas have changed their beds,—the eternal hills
Have stooped with age,—the solid continents
Have left their banks,—and man's imperial works,
The toil, pride, strength of kingdoms, which had flung
Their haughty honours in the face of Heaven,
As if immortal,—have been swept away,—
Shattered and mouldering, buried and forget.
But time has shed no dimness on thy front,
Nor touched the firmness of thy tread; youth, strength
And beauty, still are thine,—as clear, as bright,
As when the Almighty Former sent thee forth,
Beautiful offspring of his curious skill,
To watch earth's northern beacon, and proclaim
The eternal chorus of Eternal Love.

I wonder as I gaze. That stream of light,
Undimmed, unquenched,—just as I see it now,—
Has issued from those dazzling points, through years
That go back far into eternity.
Exhaustless flood! for ever spent, renewed
For ever! Yea, and those refulgent drops,
Which now descend upon my lifted eye,
Left their far fountain twice three years ago.
While those winged particles,—whose speed outstrips
The flight of thought,—were on their way, the earth
Compassed its tedious circuit round and round,
And in the extremes of annual change, beheld
Six autumns fade, six springs renew their bloom.
So far from earth those mighty orbs revolve;
So vast the void through which their beams descend!

Yea, glorious lamps of God! He may have quenched
Your ancient flames, and bid eternal night
Rest on your spheres; and yet no tidings reach
This distant planet. Messengers still come
Laden with your far fire, and we may seem
To see your lights still burning; while their blaze
But hides the black wreck of extinguished realms,
Where anarchy and darkness long have reigned.

Yet what is this, which to the astonished mind,
Seems measureless, and which the baffled thought
Confounds? A span, a point, in those domains,
Which the keen eye can traverse. Seven stars
Dwell in that bright cluster, and the sight
Embraces all at once; yet each from each
Recedes as far as each of them from earth.
And every star from every other burns
No less remote.

From the profound of heaven,
Untravelled even in thought, keen piercing rays
Dart through the void, revealing to the sense
Systems and worlds unnumbered. Take the glass,
And search the skies. The opening skies pour down
Upon your gaze thick showers of sparkling fire,—
Stars, crowded, thronged, in regions so remote
That their swift beams,—the swiftest things that be,—
Have travelled centuries on their flight to earth.
Earth, Sun, and nearer Constellations! what
Are ye, amid this infinite extent
And multitude of God's most infinite works?

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And these are Suns!—vast, central, living fires,
Lords of dependent systems, Kings of worlds,
That wait as satellites upon their power,
And flourish in their smile. Awake, my soul,
And meditate the wonder! Countless suns
Blaze round thee, leading forth their countless worlds!
Worlds,—in whose bosoms living things rejoice,
And drink the bliss of being, from the fount
Of all-pervading Love.

What mind can know,
What tongue can utter all their multitudes,—
Thus numberless in numberless abodes,
Known but to Thee, blest Father? Thine they are,
Thy children, and Thy care,—and none o'erlooked
Of Thee! No, not the humblest soul that dwells
Upon the humblest globe, which wheels its course
Amid the giant glories of the sky,
Like the mean mote that dances in the beam,
Amongst the thousand mirrored lamps which fling
Their wasteful splendour from the palace wall.
None, none escape the kindness of Thy care:
All compassed underneath Thy spacious wing,
Each fed and guided by Thy powerful hand.

Tell me, ye splendid Orbs!—as from your thrones
Ye mark the rolling provinces that own
Your sway,—what beings fill those bright abodes?
How formed, how gifted; what their powers, their state,
Their happiness, their wisdom? Do they bear
The stamp of human nature? Or has God
Peopled those purer realms with lovelier forms,
And more celestial minds? Does Innocence
Still wear her native and untainted bloom?
Or has Sin breathed his deadly blight abroad,
And sowed corruption in those fairy bowers?
Has War trod o'er them with his foot of fire?
And Slavery forged his chains, and Wrath, and Hate,
And sordid Selfishness, and cruel Lust,
Leagued their base hands to tread out Light and Truth,
And scatter woe where Heaven had planted joy?
Or are they yet all Paradise, unfallen
And uncorrupt;—existence one long joy,
Without disease upon the frame, or sin
Upon the heart, or weariness of life,—
Hope never quenched, and age unknown,
And death unfeared; while fresh and fadeless youth
Glows in the light from God's near throne of Love?

Open your lips, ye wonderful and fair!
Speak, speak! the mysteries of those living worlds
Unfold!—No language! Everlasting light,
And everlasting silence! Yet the eye
May read and understand. The hand of God
Has written legibly what man may know,—
THE GLORY OF THE MAKER. There it shines,
Ineffable, unchangeable; and man,
Bound to the surface of this pigmy globe,
May know and ask no more.

In other days
When death shall give the encumbered spirit wings,
Its range shall be extended; it shall roam,
Perchance, amongst those vast mysterious spheres,
Shall pass from orb to orb, and dwell in each
Familiar with its children,—learn their laws,
And share their state, and study and adore
The infinite varieties of bliss
And beauty, by the hand Divine
Lavished on all its works.

Eternity
Shall thus roll on with ever fresh delight;
No pause of pleasure or improvement; world
On world still opening to the instructed mind
An unexhausted universe, and time
But adding to its glories; while the soul,
Advancing ever to the source of light
And all perfection, lives, adores, and reigns,
In cloudless knowledge, purity, and bliss.

Henry Ware, jun.

CHRONOLOGY.—No. XII.

A.D.
1775.—Washington appointed Commander-in-Chief of the American army.
1780.—"No Popery" riots in London.
1781.—Discovery of the planet Uranus by Herschel.
1782.—Defeat of the French by Rodney.
1783.—Institution of the Order of St. Patrick.
Indictment of Warren Hastings for alleged extortion and peculation in India.
Recognition of American independence.
1785.—Severe frost in Europe, lasting 115 days.
Royal Society of Musicians established.
1788.—Emancipation of slaves in Philadelphia.
French Revolution commenced.
1789.—Washington elected President of the United States. (He was re-elected in 1793.)
The States of France declared themselves a "National Convention." Bastile destroyed. The King of France compelled to accept the Declaration of the "Rights of Man."
Mutiny on board the *Bounty*.
1790.—Hostilities commenced in India by the British against Tippoo Saib.
John Howard, philanthropist, died.
1791.—Robespierre elected by the French Convention "public accuser." The king arrested. Dreadful massacre of the Royalists. The abolition of Royalty.
Insurrection of the slaves in St. Domingo.
1792.—The guillotine first adopted in France.
Trial and execution of Louis XVI.
War throughout Europe. The French Republic have no less than eight armies in the field.
1795.—Great victories obtained by the French troops in Italy, and other parts of Europe.
1799.—Buonaparte appointed First Consul.
1800.—Battle of Marengo.
1802.—Peace of Amiens.
1804.—Buonaparte declared Emperor.
1805.—Battle of Austerlitz.
1806.—Battle of Jena.
Russia declared war against France.
1807.—Treaty of Tilsit.
Commencement of the Peninsular war.
1809.—English forces sent into Spain.
1812.—Buonaparte's disastrous expedition to Russia.
1814.—Buonaparte abdicates the throne of France.
1815.—Buonaparte, quitting the Island of Elba, to which he had been exiled, re-appeared in France. Defeated by the allied forces on the field of Waterloo.
Louis XVIII. makes his public entry into Paris. The British army in France reviewed by the Duke of Wellington near Paris.
1816.—Wreck of the *Medusa*.
Algiers bombarded by Lord Exmouth.
1820.—George IV. King of England.
Trial of Queen Caroline.
Discovery of the Cato Street plot.
1821.—Death of Napoleon at St. Helena.
1829.—Catholic Emancipation.
1830.—Revolution in Paris. Louis Philippe made King of the French.
Opening of the Liverpool and Manchester Railway.
1831.—First appearance of Asiatic cholera in England.
1832.—Reform Bill passed.
1837.—Queen Victoria ascended the throne.
1838.—Abolition of slavery throughout the British dominions.
1840.—Marriage of Queen Victoria and Albert, Prince of Saxe-Coburg and Gotha.
Establishment of the Penny Postage system.
1846.—Abolition of the Corn Laws.
1848.—Revolution in France, and other parts of Europe. Establishment of French Republic.
1851.—Great Industrial Exhibition in London.
1852.—Napoleon III. elected Emperor of France.
1854.—Commencement of the Crimean war.
1855.—Sebastopol captured by the allied armies.
1856.—Treaty of Paris, and close of the Crimean war.
1857.—Indian Mutiny.
1861.—Death of the Prince Consort.
1862.—Great Industrial Exhibition.
1863.—Marriage of the Prince of Wales and Princess of Denmark.
Civil war in America.

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ON PHYSICS, OR NATURAL PHILOSOPHY.

No. LXXVII.

(*Continued from page* 370.)

METEOROLOGY.—LUMINOUS METEORS.

Lightning is a dazzling light given out by the electric spark which is elicited from the meeting of two clouds charged with contrary electricity. The light of the flashes is white in the lower regions of the atmosphere, but in the upper regions, where the air is more rarefied, it assumes a violet tint, which is also the case, in similar circumstances, with the spark of the electrical machine.

The streaks of lightning are sometimes several miles in length. They are always zigzag in their course through the air. This phenomenon is attributed to the resistance of the air, which is compressed by the passage of a powerful discharge. The spark then deviates from a straight line, and takes the direction in which it meets with least resistance. In a vacuum it proceeds in a straight line.

There are four sorts of lightning. 1. Forked lightning, which moves with extreme velocity in the form of a track of fire, in directions which are regularly determined, and exactly like those of the electric spark from electrical machines. 2. Sheet lightning, which, instead of being linear in form like the preceding, fills the whole horizon, without having any definite shape or outline, like the sudden explosion of inflammable substances. This lightning, which is most frequent, seems to proceed from the depth of the clouds, and to enlighten the whole mass. 3. Heat lightning, so called because it appears in the nights of summer without any cloud being seen above the horizon, or any sound being heard. Many hypotheses have been proposed for explaining the origin of this lightning. The most probable is, that it is nothing more than ordinary lightning, which is produced in clouds above the horizon at such distances that the reverberation of the thunder cannot reach the ear of the observer. 4. Lightning which appears under the form of globes of fire. This lightning, which is sometimes visible for more than ten seconds, descends from the clouds to the earth slowly enough to be followed by the eye. These globes often rebound from the surface of the earth; at other times they separate into parts, and explode with a noise like that of several pieces of cannon. It has been remarked that it is generally under this form that lightning penetrates through buildings. The origin of lightning is unknown.

The duration of the first three sorts of lightning is not a millionth part of a second, as may be thus proved, according to Professor Wheatstone: "Take a wheel, and get it turned with such rapidity that the spokes are invisible; on lighting them with a flash of lightning, the duration of the flash is so short that the wheel—whatever be the velocity with which it revolves—appears completely unmoved, that is to say, its displacement is not perceptible during the continuance of the flash."

Thunder is the violent explosion which succeeds the lightning in stormy clouds. The flash and the sound are always simultaneous, but an interval of several seconds occurs between our perception of them, owing to the fact that light travels much faster than sound.

The noise of thunder arises from the violent agitation excited in the cloud and the air by the electric discharge, an agitation rendered perceptible by the experiment with Kinnersley's thermometer. Near the place where the lightning flashes forth, the sound of the thunder is sharp, and of short duration. Farther off we hear a series of reports rapidly succeeding one another. At a still greater distance, the noise, which is indistinct and feeble at first, afterwards changes into a prolonged rolling sound of varied intensity. Various attempts have been made to explain the rolling of thunder, but none have proved perfectly satisfactory. Some attribute it to the reverberation of the sound between the earth and the clouds. Others consider lightning, not as a single electric spark, but as a series of elementary sparks, each of which gives rise to a separate report. Now, as these partial reports proceed from points at different distances, and from zones of unequal density, the consequence is, that not only do they reach the ear of the observer one after the other, but they produce impressions upon it of different intensity, and hence arise the duration and inequality of the rolling sound. Lastly, this phenomenon has been attributed to the zigzag course of lightning, by supposing that there is a maximum of compression of the air at each angular point, which causes the unequal intensity of the sound.

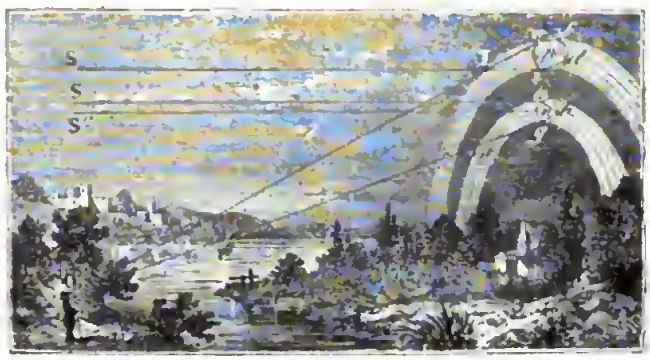


Fig. 488.

Effects of Lightning.—The electric discharge which takes place between a stormy cloud and the earth is popularly known as the thunderbolt. The earth, under the influence of the electricity of the cloud, becomes charged with contrary electricity, and when the attraction between the two contrary electricities overcomes the resistance of the air, the spark is elicited, which is expressed in popular language by saying that the thunderbolt falls. It is generally believed that lightning moves upwards from below, but a contrary direction is often observed, and it is more probable that the lightning flashes from both the cloud and the earth at the same time.

According to the first law of electric attraction, lightning ought to fall upon objects which are nearest the cloud and the best conductors. And, indeed, it is observed that the objects struck are trees, high buildings, and metals. For this reason it is well known to be dangerous to get under trees during a thunder-storm, particularly if the trees are good conductors, such as oaks and elms. But the danger is not so great with resinous trees, such as pines, because they are not good conductors of electricity.

The effects of lightning are very varied, and of the same nature as those of batteries, but possessing a more energetic intensity. Lightning kills men and animals, sets fire to combustible materials, melts metals and breaks to pieces bodies that are not good conductors. On penetrating the earth, it melts the silicious substances that occur in its path, and thus produces vitrified tubes, which are often called thunderbolts, and are supposed by ill-informed persons to have been hurled

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from the sky. Lastly, on falling upon iron bars, it magnetises them, and often reverses the poles of the compass needle.

Lightning generally diffuses in its course a smell like that of sulphur on fire, or like a phosphorescent substance. This smell is attributed to an oxygenous compound formed under the influence of the electric discharge, and called *ozone*.

The thunder shock is a violent and even mortal shock, sometimes experienced by men and animals at some considerable distance from the place where the lightning flashed forth. This phenomenon arises from the action by influence which the stormy cloud exerts upon all bodies placed within the sphere of its activity. These bodies are then, like the earth, charged with a contrary electricity to that of the cloud, but if the cloud is discharged by the recombination of its electricity with that of the earth, the influence immediately ceases, and the bodies returning suddenly from the electric to the neutral state, a shock ensues. This phenomenon may be rendered perceptible by placing a frog near a very powerful electrical machine, when it will experience a sudden shock as each spark is elicited.

Lightning Conductors.—A *lightning conductor* is a rod of iron intended to afford an easy passage to the electricity of the earth, which is attracted by the contrary electricity of the stormy clouds. The invention of this invaluable protection against the injuries of lightning was the work of Franklin in 1755.

There are two distinct parts in the lightning conductor, the rod and the conductor. The *rod* is a straight iron bar, pointed at the end, and fastened vertically to the summit of the buildings which we wish to preserve from the lightning stroke. It is twenty or thirty feet long, and the section at the base is a square, two inches or two inches and a-half each way. The *conductor* is an iron bar which descends from the bottom of the rod to the earth, into which it sinks deeply. As iron bars cannot easily be made to follow all the varied directions of the outlines of buildings, it is better to make use of iron wire cords like those employed in the construction of suspension bridges.

The conductor generally goes into a well, and, in order to establish a better connection with the earth, has two or three branches at the end. If there is no well near, dig a hole in the ground, from about thirteen to twenty feet deep, and after having placed the foot of the conductor in it, fill it up with charcoal, which is a good conductor.

The theory of lightning conductors is explained by that of electrisation by influence or induction, and the power of the points. Franklin, who had no sooner established the identity of lightning and electricity, than he thought of applying the power of the points to lightning conductors, thought that the conductors withdrew electricity from the clouds, but, in fact, the contrary is the case. When a stormy cloud, electrised positively, for example, rises in the atmosphere, it acts by influence or induction upon the earth, repels to a distance the positive fluid, and attracts the negative fluid which is accumulated upon bodies placed on the surface of the ground, and the more abundantly in proportion as these bodies are raised to a greater height. Consequently, it is the highest which have the greatest tension, and which, therefore, are more exposed to the electric discharge. But if these bodies are armed with metallic points like the rods of lightning conductors, the negative fluid which is attracted from the earth by the influence of the cloud, escapes into the atmosphere and neutralises the positive fluid of the cloud. Consequently, not only does a lightning conductor prevent the accumulation of electricity at the surface of the earth, but it also tends to bring the stormy clouds back to their natural state—a double effect, which is intended to prevent the thunder-stroke. However, the disengagement of electricity is sometimes so abundant, that the lightning-conductor is insufficient to discharge the earth, and accordingly the electric fluid strikes the building, but it is the conductor which receives the stroke, on account of its greater conductibility, and thus the building is preserved.

Experience has shown that a lightning conductor effectually protects a space round it, the radius of which is double the height of the conductor.

A lightning conductor, to be effectual, ought to satisfy the following conditions. 1, The rod should be thick enough not to be melted if the lightning strikes it. 2, It ought to end in a point, to afford an easier passage for the electricity which is disengaged from the earth. For this purpose, it is customary to put a platinum or gilded copper point at the end, to prevent oxidation, or rusting, as it is popularly termed. 3, There ought to be no break from the top of the rod to the earth. 4, The connection of the rod with the earth should be as close as possible. 5, If the building armed with the lightning conductor contains pieces of metal of considerable extent, as a zinc covering or metal gutters, they must be connected with the conductor of the lightning conductor.

If the last three conditions are not fulfilled, there is a danger of lateral discharges, that is to say, the electric spark may flash out between the conductor and the building, and then the conductor increases, instead of removing the danger.

The rainbow is a luminous meteor which appears in the clouds opposite the sun, when they are changed into the form of rain. It consists of seven concentric arcs, presenting in succession the seven colours of the solar spectrum. Sometimes only one rainbow is observed, but there are generally two, an inner one, the colours of which are brighter, and an outer one, which is paler, and in which the order of the colours is reversed. In the inner bow, the red is highest, in the other violet. On some few occasions three rainbows are observed. Theory would seem to show that there may be a greater number, but their colours are so faint that they escape our view.

The phenomenon of the rainbow arises from the decomposition of the white light of the sun at the moment when it penetrates the drops of rain, and the reflection of this light on the inner surface of the drops. The same phenomenon is observed in drops of dew, fountains, and indeed wherever the light of the sun penetrates drops of water at a certain angle.

The appearance of the rainbow, and its magnitude, depend upon the position of the spectator and the height of the sun above the horizon; whence we may infer that all the rays refracted by the drops of rain, and reflected from their concave surface, are not equally adapted to produce the phenomenon. Those which are capable of producing it, are called *effective rays*.

To explain this effectiveness, let there be a drop of water, *n*, fig. 488, into which a solar ray *s a* passes. At the point of incidence *a*, part of the light is reflected by the surface of the liquid, the rest penetrates it, being at the same time decomposed, and passes through the globule in the direction *a b*. On reaching *b*, part of the light passes out of the drop of rain beyond, the remainder being reflected by the concave surface and returning in the direction *b g*. At *g* the light is again partially reflected, the remainder proceeding in a direction, *g o*, which forms, with the incident ray *s a*, an angle, called the *angle of deviation*. It is rays such as *g o*, emerging from the drop on the side of the observer, which produce the sensation of the colours, provided, however, that the light is sufficiently intense.

Now it is proved by calculation, that in a series of parallel rays which fall upon the same drop, and are subject to only one reflection in its interior, the angle of deviation successively increases from the ray *s" n*, for which it is nothing, up to a certain limit beyond which it decreases; and that near this limit, rays entering a drop of rain parallel to each other come out parallel. From this parallelism results a pencil of light which possesses sufficient intensity to make an impression upon the retina. It is, therefore, the rays which come out parallel to each other that are effective.

The various colours which compose white light being unequally refrangible, the maximum of the angle of deviation is not the same for all. Calculation shows, that for red rays the value of the angle of deviation corresponding to effective rays is 42° 2', and for violet rays 40° 17'. Hence it follows, that, for all drops placed in such a manner that the rays which go from the sun to the drop make, with those which go from the drop to the eye, an angle of 42° 2', this organ receives the sensation of red, which is evidently the case with all drops situated in the circumference of the base of a cone having its axis parallel to the solar rays, and the angle contained by the two generating lines (or the two boundaries of a section through the axis of a cone) equal to 84° 4'. Such is the formation of the red stripe in the rainbow. For the violet stripe, the angle of the cone is 80° 34',

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The cones corresponding to each stripe have the same axis, which is called the axis of vision. This straight line being parallel to the rays of the sun, it follows that when the sun is in the horizon, the axis of vision is itself horizontal, and the rainbow appears in the form of a semi-circle. If the sun is raised above the horizon, the axis of vision is lowered, and with it the rainbow. Lastly, when the sun is 42° 2′ above the horizon, the rainbow disappears altogether below the horizon. Hence it is never seen except in the morning or evening.

All that we have stated applies to the inner bow. With regard to the outer one, it is formed by rays which have undergone two reflections, as is seen in the ray *s′ t d f e o* in the drop *p*. The angle *s′ t o*, formed by the emerging and incident rays, is called the angle of deviation, as before. In the present case, however, this angle is not susceptible of a maximum, but of a minimum, which varies according to the different kinds of rays, and which has effective rays corresponding to it. It is proved by calculation, that for violet rays the minimum angle is 54° 7′, and for red rays only 50° 57′, which explains why the red bow is in this case inside and the violet outside. As at each interior reflection in the drop of water there is a loss of light, the outer bow always exhibits fainter colours than the inner one. The outer bow ceases to be visible when the sun is more than 54° above the horizon.

The moon produces rainbows as well as the sun, which are called lunar rainbows, but they are very pale.

BIOGRAPHY.—No. XXVIII.

MARY RUSSELL MITFORD.

This lady was born on the 16th of December, 1786, at Abresford, in Hampshire. Her father was of an old Northumberland family, one of the Mitfords of Mitford Castle; her mother the only daughter of the Rev. Dr. Russell of Ash, in Hampshire, and she was their only child. When still a young girl, about the year 1806, Miss Mitford published a volume of miscellaneous poems, and two volumes of narrative poetry after the manner of Scott, "Christina, the Maid of the South Seas" (founded upon the story of the mutineers of the Bounty, afterwards taken by Lord Byron), and "Blanche, a Spanish Story." These books sold well and obtained a fair share of popularity, and some of them were reprinted in America. However, Miss Mitford herself was not satisfied with them, and for several of the following years devoted herself to reading instead of writing; indeed it is doubtful whether she would ever have written again had not she, with her parents, been reduced from the high affluence to which they were born to comparative poverty. Filial affection induced her to resume the pen she had so long thrown aside, and accordingly she wrote the series of papers which afterwards formed the first volume of "Our Village: Sketches of Rural Character and Scenery," about 1820. But so little was the peculiar and original excellence of her descriptions understood at first, that, after being rejected by the more important publications, they at last saw the light in the "Lady's Magazine." The public were not long in discovering the beauties of a style so fresh yet so finished, and in appreciating the delicate humour and the simple pathos of these tales; and the result was, that the popularity of these sketches outgrew that of the works of a loftier order from the same pen; and every nook and corner of the cluster of cottages around Three-Mile-Cross, near Reading, in Berkshire, is as well known as the streets and lanes around the reader's own home. Four other volumes of sketches were afterwards added; the fifth, and last, in 1832. Extending her observation from the country village to the market-town, Miss Mitford published another interesting volume of descriptions, entitled "Belford Regis." She edited three volumes, called "Stories of American Life by American Writers." She also published a volume of "Country Stories;" a volume of "Dramatic Scenes;" an opera called "Sadak and Kalasrade," and four tragedies, the first entitled "Julian," which was represented in London, in 1823, Mr. Macready playing Julian. Her next was "Foscari;" then "Rienzi" and "Charles the First;" all were successful. "Rienzi," in particular, long continued a favourite. She also edited four volumes of "Finden's Tableaux:" and a series of papers called "Readings of Poetry, Old and New."

Although her tragedies show great intellectual powers, and a highly cultivated mind, yet it is by her sketches of English life that she has obtained the greatest share of her popularity, and it is on them her fame will chiefly depend. In these descriptions Mary Mitford is unrivalled. Her manner is inimitable and indescribable, and sheds interest around the most homely subjects and coarsest characters. Who ever threw by a sketch of hers half read? No one who admired a spring daisy—or that most fragrant blossom, the wallflower, which beautifies every object, however rough, rude or ruinous, around which it wreathes. And though she does not trace the motives of conduct very deeply, or attempt to teach principles of moral duty, yet there is much in her sprightly and warm sketches of simple nature which draws the heart to love the Author of all this beauty; and much in her kind and contented philosophy to promote love and good feelings. She was a philanthropist, for she took pleasure in the happiness of others—a patriot, for she drew the people to feel the beauties and blessings which surround the most lowly lot in the "land of proud names and high heroic deed."

"As a proof that we *love her, we love her dog*," says an American writer. "Walter Scott's stately Maida is not more an historical character than her springing spaniel, or Italian greyhound. If she began by being prosaic in poetry, she has redeemed herself by being most poetic in pastoral prose."

In 1833 Miss Mitford's name was added to the pension list, a well-earned tribute to one whose genius has been devoted to the honour and embellishment of her country. After a long period of decline and helpless suffering, cheerfully borne, this eminent lady died lately at Swallowfield Cottage, near Reading, aged sixty-six years.

WHITSUN-EVE—MY GARDEN.

"The pride of my heart and the delight of my eyes is my garden. Our house, which is in dimensions very much like a bird-cage, and might, with almost equal convenience, be laid on a shelf, or hung up in a tree, would be utterly unbearable in warm weather, were it not that we have a retreat out of doors,—and a very pleasant retreat it is. To make my readers fully comprehend it, I must describe our whole territories.

"Fancy a small plot of ground, with a pretty low irregular cottage at one end; a large granary, divided from the dwelling by a little court running along one side; and a long thatched shed open towards the garden, and supported by wooden pillars on the other. The bottom is bounded, half by an old wall, and half by an old paling, over which we see a pretty distance of woody hills. The house, granary, wall, and paling, are covered with vines, cherry-trees, roses, honeysuckles, and jessamines, with great clusters of tall hollyhocks running up between them; a large elder overhanging the little gate, and a magnificent bay-tree, such a tree as shall scarcely by matched in these parts, breaking with its beautiful conical form the horizontal lines of the buildings. This is my garden; and the long-pillared shed, the sort of rustic arcade which runs along one side, parted from the flower-beds by a row of rich geraniums, is our out-of-door drawing-room.

"I know nothing so pleasant as to sit there on a summer afternoon, with the western sun flickering through the great elder-tree, and lighting up our gay parterres, where flowers and flowering shrubs are set as thick as grass in a field, a wilderness of blossom, interwoven, intertwined, wreathy, garlandy, profuse beyond all profusion, where we may guess that there is such a thing as mould, but never see it. I know nothing so pleasant as to sit in the shade of that dark bower, with the eye resting on that bright piece of colour, lighted so gloriously by the evening sun, now catching a glimpse of the little birds as they fly rapidly in and out of their nests—for there are always two or three birds'-nests in the thick tapestry of cherry-trees, honeysuckles, and China-roses, which cover our walls—now tracing the gay gambols of the common butterflies as they sport around the dahlias; now watching that rarer moth, which the country people, fertile in pretty names, call the bee-bird;* that bird-like insect, which flutters in the

* *Sphynx ligustri*, privet hawk-moth.

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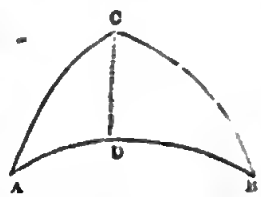
hottest days over the sweetest flowers, inserting its long proboscis into the small tube of the jessamine, and hovering over the scarlet blossoms of the geranium, whose bright colour seems reflected on its own feathery breast; that insect which seems so thoroughly a creature of the air, never at rest; always, even when feeding, self-poised, and self-supported, and whose wings, in their ceaseless motion, have a sound so deep, so full, so lulling, so musical. Nothing so pleasant as to sit amid that mixture of the flower and the leaf, watching the bee-bird! Nothing so pretty to look at as my garden! It is quite a picture; only unluckily it resembles a picture in more qualities than one,—it is fit for nothing but to look at. One might as well think of walking in a bit of framed canvas. There are walks, to be sure—tiny paths of smooth gravel, by courtesy called such—but they are so overhung by roses and lilies, and such gay encroachers—so overrun by convolvulus, and heart's-ease, and mignionette, and other sweet stragglers, that except to edge through them occasionally, for the purposes of planting, or weeding, or watering, there might as well be no paths at all. Nobody thinks of walking in my garden. Even May glides along with a delicate and trackless step, like a swan through the water; and we, its two-footed denizens, are fain to treat it as if it were really a saloon, and go out for a walk towards sun-set, just as if we had not been sitting in the open air all day.

"What a contrast from the quiet garden the lively street! Saturday night is always a time of stir and bustle in our Village, and this is Whitsun-Eve, the pleasantest Saturday of all the year, when London journeymen and servant lads and lasses snatch a short holiday to visit their families. A short and precious holiday, the happiest and liveliest of any; for even the gambols and merry-makings of Christmas offer but a poor enjoyment, compared with the rural diversions, the Mayings, revels, and cricket-matches of Whitsuntide."

LESSONS IN TRIGONOMETRY.—No. V.

OBLIQUE-ANGLED SPHERICAL TRIANGLES.

THEOREM III. *In any spherical triangle, the sines of the sides are proportional to the sines of the opposite angles.*



In the case of right-angled spherical triangles, this proposition has already been demonstrated. Let, then, A B C be an oblique-angled triangle; we are to prove that

sin. B C : sin. A C :: sin. A : sin. B.

Through the point C draw an arc of a great circle C D perpendicular to A B. Then, in the spherical triangle A C D, right-angled at D, we have, by Napier's rule,

R sin. C D = sin. A C sin. A.

Also, in the triangle B C D, we have,

R sin. C D = sin. B C sin. B.

Hence, sin. A C sin. A = sin. B C sin. B.

or, sin. B C : sin. A C :: sin. A : sin. B.

Cor. 1. In any spherical triangle, *the cosines of the sides are proportional to the cosines of the segments of the base, made by a perpendicular from the opposite angle.*

For, by Theorem I., Cor. 2,

cos. C D : R :: cos. A C : cos. A D.

Also, cos. C D : R :: cos. B C : cos. B D.

Hence, cos. A C : cos. B C :: cos. A D : cos. B D.

Cor. 2. *The cosines of the angles at the base are proportional to the sines of the segments of the vertical angle.*

For, by Theorem I., Cor. 3,

cos. C D : R :: cos. A : sin. A C D,

Also, cos. C D : R :: cos. B : sin. B C D.

Hence, cos. A : cos. B :: sin. A C D : sin. B C D.

Cor. 3. *The sines of the segments of the base are reciprocally proportional to the tangents of the angles at the base.*

For, by Theorem II.,

sin. A D : R :: tan. C D : tan. A.

Also, sin. B D : R :: tan. C D : tan. B.

Hence, sin. A D : sin. B D :: tan. B : tan. A.

Cor. 4. *The cotangents of the two sides are proportional to the cosines of the segments of the vertical angle.*

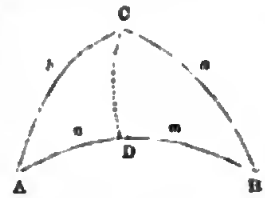
For, by Theorem II., Cor. 2,

cos. A C D : cot. A C :: tan. C D : R.

Also, cos. B C D : cot. B C :: tan. C D : R.

Hence, cos. A C D : cos. B C D :: cot. A C : cot. B C.

THEOREM IV. *If from an angle of a spherical triangle a perpendicular be drawn to the base, then the tangent of half the sum of the segments of the base is to the tangent of half the sum of the sides, as the tangent of half the difference of the sides is to the tangent of half the difference of the segments of the base.*



Let A D C be any spherical triangle, and let C D be drawn from C perpendicular to the base A B; then tan. ½(B D + A D) : tan. ½(B C + A C) :: tan. ½(B C − A C) : tan. ½(B D − A B).

Let B C = *a*, A C = *b*, B D = *m*, and A D = *n*. Then, by Theorem III., Cor. 1,

cos. *a* : cos. *b* :: cos. *m* : cos. *n*.

Whence,

cos. *a* + cos. *b* : cos. *a* − cos. *b* :: cos. *m* + cos. *n* : cos. *m* − cos. *n*.

But by Trigonometry,

cos. *a* + cos. *b* : cos. *a* − cos. *b* :: cot. ½(*a* + *b*) : tan. ½(*a* − *b*).

Also,

cos. *m* + cos. *n* : cos. *m* − cos. *n* :: cot. ½(*m* + *n*) : tan. ½(*m* − *n*).

Therefore,

cot. ½(*a* + *b*) : cot. ½(*m* + *n*) :: tan. ½(*a* − *b*) : tan. ½(*m* − *n*)

But, since tangents are reciprocally as their cotangents, we have,

cot. ½(*a* + *b*) : cot. ½(*m* + *n*) :: tan. ½(*m* + *n*) : tan. ½(*a* + *b*).

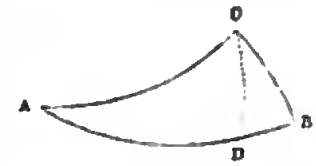
Hence,

tan. ½(*m* + *n*) : tan. ½(*a* + *b*) :: tan. ½(*a* − *b*) : tan. ½(*m* − *n*)

In the solution of oblique-angled spherical triangles, six cases may occur, viz.:

1. Given two sides and an angle opposite one of them.
2. Given two angles and a side opposite one of them.
3. Given two sides and the included angle.
4. Given two angles and the included side.
5. Given the three sides.
6. Given the three angles.

CASE 1. *Given two sides and an angle opposite one of them, to find the remaining parts.*



In the triangle A B C, let there be given the two sides A C and B C, and the angle A opposite one of them. The angle B may be found by Theorem III.

sin. B C : sin. A C :: sin. A : sin. B

From the angle C let fall the perpendicular C D upon the side A B. The triangle A B C is divided into two right-angled triangles, in each of which there is given the hypothenuse and the angle at the base. The remaining parts may then be found by Napier's rule.

Ex. 1. In the oblique-angled spherical triangle A B C, the side A C = 70° 10′ 30″, B C = 80° 5′ 4″, and the angle A = 33° 15′ 7″. Required the other parts.

sin. B C : sin. A C : : sin. A : sin. D = 31° 34′ 38″.

Then, in the triangle A C D,

R cos. A C = cot. A cot. A C D.

Whence, A C C = 77° 27′ 47″.

Also, in the triangle B C D,

R cos. B C = cot. B cot. B C D.

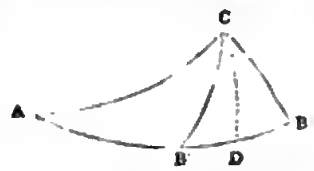
Whence, B C D = 83° 57′ 29″,

Therefore, A C B = 161° 25′ 16″.

To find the side A B.

sin. A : sin. A C B : : sin. B C : sin. A B = 145° 5′ 0″.

When we have given two sides and an opposite angle, there are, in general, two solutions, each of which will satisfy the conditions of the problem. If the side A C, the angle A, and the side opposite this angle are given, then, with the latter for radius, describe an arc cutting the arc A a in the points a and a′. The arcs C D, C′ will be equal, and each of the triangles A C D, A C a′ will satisfy the conditions of the problem. There is the same ambiguity in the numerical computation. The angle B is found by means of its *sine*. But this may be the sine either of A B C, or of its *supplement* A B′ C. In the preceding example, the first proportion leaves it ambiguous whether the angle B is 31° 34′ 38″, or its supplement 148° 25′ 22″. In order to avoid false solutions, we should remember that *the greater side of a spherical triangle must lie opposite the greater angle, and conversely.* Thus, since in the preceding example the side A C is less than B C, the angle B must be less than A, and therefore cannot be obtuse.

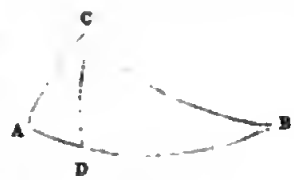


Ex. 2. In the spherical triangle A B C, the side a = 124° 53′, b = 31° 19′, and the angle A = 16° 26′. Required the remaining parts.

Ans. $\begin{cases} B = 10° 19′ 34″. \\ c = 171° 48′ 22″. \\ c = 155° 35′ 22″. \end{cases}$

Case II. *Given two angles and a side opposite one of them, to find the remaining parts.*

In the triangle A B C let there be given two angles, as A and B, and the side A C opposite to one of them. The side D E may be found by Theorem III.



sin. B : sin. A : : sin. A B : sin. B C.

From the unknown angle C draw C D perpendicular to A B; then will the triangle A B C be divided into two right-angled triangles, in each of which there is given the hypothenuse and the angle at the base. Whence we may proceed by Napier's rule, as in Case I.

Ex. 1. In the oblique-angled spherical triangle A B C, there are given the angle A = 52° 20′, B = 63° 40′, and the side b = 83° 25′. Required the remaining parts.

sin. B : sin. A : : sin. A B : sin. B E = 61° 19′ 53″.

Then, in the triangle A C D,

cot. A C : R : : cos. A : tan. A D = 79° 18′ 17″.

Also, in the triangle B E D,

cot. B C : R : : cos. B : tan. B D = 39° 3′ 8″.

Hence, A B = 118° 21′ 25″

To find the angle A C B.

sin. B J : sin. A B : : sin. A : sin. A C B = 127° 26′ 47″.

When we have given two angles and an opposite side, there are, in general, two solutions, each of which will satisfy the conditions of the problem. If the angle A, the side A C, and the angle opposite this side are given, then through the point C there may generally be drawn two arcs of great circles C a, C B′, making the same angle with A B, and each of the triangles A B C, A B′ C will satisfy the conditions of the problem. There is the same ambiguity in the numerical computation, since the side B E is found by means of its *sine*. In the preceding example, however, there is no ambiguity, because the angle A is less than B, and therefore the side a must be less than b, that is, less than a quadrant.



Ex. 2. In the oblique-angled spherical triangle A B C, the angle A is 125° 45′, the angle C = 30° 35′, and a E = 68° 50′. Required the remaining parts.

Ans. $\begin{cases} A B = 37° 28′ 20″. \\ A C = 40° 9′ 4″. \\ B = 82° 37′ 58″. \end{cases}$

Case III. *Given two sides and the included angle, to find the remaining parts.*

In the triangle A B C let there be given two sides, as A B, A C, and the included angle A. Let fall the perpendicular C D on the side A B; then, by Napier's rule,

R cos. A = tan. A D cot. A C.

Having found the segment A D, the segment B D becomes known; then, by Theorem III., Cor. 3,

sin. B D : sin. A D : : tan. A : tan. B.

The remaining parts may now be found by Theorem III.

Ex. 1. In the spherical triangle A B C, the side A B = 73° 20′, A C = 41° 45′, and the angle A = 30° 30′. Required the remaining parts.

cot. A C : cos. A : : R : tan. A D = 37° 33′ 41″.

Hence, B D = 35° 46′ 19″,

sin. B D : sin. A D : : tan. A : tan. B = 31° 33′ 43″.

Also, by Theorem III., Cor. 1,

cos. A D : cos. B D : : cos. A C : cos. B C = 40° 12′ 59″

Then, by Theorem III.,

sin. B C : sin. A B : : sin. A : sin. A C B = 131° 8′ 46″.

Ex. 2. In the spherical triangle A B C, the side A B = 78° 15′, A C = 56° 20′, and the angle A = 120°. Required the other parts.

Ans. $\begin{cases} B = 48° 57′ 29″. \\ C = 62° 31′ 40″. \\ B C = 107° 7′ 45″. \end{cases}$

Case IV. *Given two angles and the included side, to find the remaining parts.*

In the triangle A B C let there be given two angles, as A and A C B, and the side A C included between them. From C let fall the perpendicular C D on the side A B. Then, by Napier's rule,

R cos. A C = cot. A cot. A C D.

Having found the angle A C D, the angle B C D becomes known; then, by Theorem III., Cor. 4,

cos. A C D : cos. B C D : : cot. A C : cot. B C.

The remaining parts may now be found by Theorem III.

Ex. 1. In the spherical triangle A B C, the angle A = 32° 10′, the angle A C B = 133° 20′, and the side A C = 39° 15′. Required the other parts.

cot. A : cos. A C : : R : cot. A C D = 64° 1′ 57″.

Hence, B C D = 63° 18′ 3″.

Then,

cos. A C D : cos. B C D : : cot. A C : cot. B C = 45° 20′ 43″.

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Also, by Theorem III., Cor. 2,

sin. A C D : sin. B C D : : cos. A : cos. B = 28° 15′ 47″.

Then, by Theorem III.,

sin. B : sin. A O B : : sin. A O : sin. A B = 76° 23′ 5″.

Ex. 2. In the spherical triangle A B C, the angle A = 125° 20′, the angle C = 48° 30′, and the side A C = 83° 13′. Required the remaining parts.

Ans. { A B = 56° 39′ 9″. B C = 114° 30′ 24″. B = 62° 34′ 35″.

Case V. *Given the three sides of a spherical triangle, to find the angles.*

In the triangle A B C let there be given the three sides. From C drew C D perpendicular to A B. Then, by Theorem IV.,

tan. ½A B : tan. ½(A C + B C) : : tan. ½(A C — B C) : tan. ½(A D — B D).

Hence A D and B D become known; then, by Napier's rule,

R cos. A = tan. A D cot. A C.

The other angles may now be easily found.

Ex. 1. In the spherical triangle A B C, the side A B = 112° 25′, A C = 60° 20′, and B C = 81° 10′. Required the angles.

tan. 56° 12½′ : tan. 70° 45′ : : tan. 10° 25′ : tan. 19° 24′ 26″.

Hence, A D = 36° 48′ 4″, and B D = 75° 36′ 56″.

Then, R : tan. A D : : cot. A C : cos. A = 64° 40′ 36″.

Also, R : tan. B D : : cot. B C : cos. B = 52° 42′ 12″.

Then,

sin. A C : sin. A B : : sin. B : sin. A C B = 122° 11′ 6″.

Ex. 2. In the spherical triangle A B C, the side A B = 40° 35′, A C = 39° 10′, and B C = 71° 15′. Required the angles.

Ans. { A = 130° 35′ 56″. B = 30° 25′ 33″. C = 31° 26′ 34″.

Case VI. *Given the three angles of a spherical triangle, to find the sides.*

If A, B, C are the angles of the given triangle, and *a*, *b*, *c* its sides, then 180° — A, 180° — B, and 180° — C are the sides of its polar triangle, whose angles may be found by Case V. Then the supplements of those angles will be the sides *a*, *b*, *c* of the proposed triangle.

Ex. 1. In the spherical triangle A B C, the angle A = 125° 34′, B = 98° 44′, and C = 61° 53′. Required the sides.

The sides of the polar triangle are,

54° 26′, 81° 16′, and 118° 7′.

From which, by Case V., the angles are found to be,

134° 6′ 21″, 41° 28′ 17″, and 53° 34′ 47″.

Hence the sides of the proposed triangle are,

A B = 45° 53′ 39″, B C = 138° 31′ 43″, and A C = 126° 25′ 13″.

Ex. 2. In the spherical triangle A B C, the angle A = 109° 55′ B = 116° 38′, and C = 120° 43′. Required the sides.

Ans. { *a* = 98° 21′ 20″. *b* = 109° 50′ 10″. *c* = 115° 13′ 7″.

LESSONS IN GREEK.—No. LXII.

By John R. Beard, D.D.

Interrogative and Imperative Sentences.

Interrogative sentences are simple sentences put in the way of a question. Thus, instead of saying, "The man is good," I say interrogatively, "Is the man good?" But this interrogation, though in itself a simple sentence, is incomplete, inasmuch as for its completeness it wants an answer. It is thus seen that interrogative sentences form the transition point between simple and compound sentences.

The specimen of an interrogative sentence given above, is that of a direct *interrogative*. The sentence is called a direct interrogative sentence, because it simply and directly asks a question. If, however, I put the sentence thus, "I do not know whether the man is good," then I form what is called an indirect interrogative sentence; that is, a sentence in which a question is implied or involved. Thus the sentence, "I do not know whether the man is good," is equivalent to, "Is the man good?" and, "I do not know." An indirect interrogative sentence is, consequently, a compound sentence.

Interrogative sentences are formed in Greek by means of interrogative words. Such words are numerous in Greek, if only because the language has two forms of words, one for the direct and one for the indirect interrogatory. The indirect interrogatives are formed from the direct, by prefixing to the latter the syllable ὁ, by which it is indicated that the question rests on the foregoing sentence or clause.

A sentence is formed by the junction of a predicate with a subject. Your question may, therefore, refer to the subject, and you ask of what subject a certain thing is to be predicated. Hence arise what are called noun-questions; that is, questions in which you ask for the noun. But your question may relate also to the predicate, and you then ask what is said of the subject? Hence, *who* and *what* involve the substance of interrogations; as, who did it? what did he do? As the questions which ask for the doer are called noun-questions, so questions which ask for the thing done may be called fact-questions. Accordingly we have, in noun-questions,

1. To obtain the subject or the object.

Direct.	*Indirect.*
τίς, who? τίνα, whom?	ὅστις, who.
πότερος, which of the two?	ὁπότερος, which of the two.

2. To obtain the quality of the subject or the object.

Direct.	*Indirect.*
ποῖος, of what kind?	ὁποῖος, of what kind.
πόσος, how much? how great?	ὁπόσος, how great.
πηλίκος, how old?	ὁπηλίκος, how old.
ποδαπός, from what country?	ὁποδαπός, from what country.

In fact-questions:

Direct.	*Indirect.*
ποῦ, where?	ὅπου, where.
ποῖ, whither?	ὅποι, whither.
πόθεν, whence?	ὁπόθεν, whence.
πῶς, how?	ὅπως, how.
πῇ, in what way?	ὅπῃ, in which way.

Causal interrogatives, or such as ask for the cause or reason of a thing, are formed by the interrogative pronouns, in connection with a preposition; as, διὰ τί; why? τοῦ ἕνεκα; on what account? ἐπὶ τῷ; on what condition? Indirect, διότι, ὅτου ἕνεκα, ἀφ' ὅτῳ, etc. In the same way are formed some of the temporal interrogatives; as, μέχρι τοῦ; how long? so, μέχρι ποσοῦ; μέχρις ὅσου.

Sometimes the direct interrogative is employed instead of the indirect, the question being put independently: *e.g.*

εἰπέ μοι, ποῖον τι νομίζεις εὐσέβειαν εἶναι:
tell me, what do you consider piety to be?

That is, "What do you consider piety to be? pray tell me."

Sometimes the direct and the indirect are connected together: *e.g.*

οὐ γὰρ αἰσθάνομαι σου, ὁποῖον νόμιμον ἢ ποῖον δίκαιον λέγεις
I do not learn from you what you call lawful, or what just.

In the interchanges of conversation, the indirect question answers the direct in asking the question indirectly: *e.g.*

A. τίς γὰρ εἶ: who art thou?
B. ὅστις: who I am?

In English, a question may be asked by merely inverting the order of the verb and the subject, as, *eatest thou?* This form, which is rare in English, is still rarer in Greek, in which questions are generally asked by means of certain interrogative words placed at the head of the sentence. These interrogatives serve to denote the view, the object, or the feeling under which the question is put, though some of them have so

slender a signification, as scarcely to admit of English equivalents. If we speak of them separately, we may remark that:—

1. ἆρα (corresponding to the Latin *num*), *whether*, implies something preceding as the ground of the question, and an anxiety on the part of the inquirer as to the answer. This is the most common form of interrogation; and often, by taking to itself the particle οὖν, *then*, or the negatives οὐ and μή, the particle involves its own answer: *e.g.*

Simple Interrogation.

ἆρα μου μεμνησθε; do you remember me?

Interrogation requiring an Affirmative Answer.

ἆρ' οὐχι μῶρον ἐστι τουγχειρημα σου
is not your attempt foolish? "Yes."

Interrogation requiring a Negative Answer.

ἆρα μη ιατρος βουλει γινεσθαι
surely you do not wish to become a physician? "No."

When a double question, or a question with an alternative member, is asked, ἆρα is superseded by ποτερον or ποτερα, which merely intimates that the question relates to two mutually excluding points: *e.g.*

ποτερον μοιφ μει βουλει διαλεχθηναι, η και μετα των αλλων;
do you wish to speak to me by myself, or together with the rest?

2. ἦ, *truly*, shows that the interrogator has a special interest in ascertaining the true state of things, and may, consequently, be rendered by "in truth," "really;" but it is often untranslateable: *e.g.*

ἦ οὗτοι πολιμοι εισιν;
are those enemies?

Other particles are adjoined to ἦ. These strengthen the original one, as, ἦ δη, ἦ δητα; or they weaken its force, as, ἦ που; or they ground the question on something else, and so give it more amphasis, as, ἦ γαρ, *for truly*; which, when it stands as an independent elliptical sentence, may be rendered, *is it not so?*

3. μῶν (formed out of μη οὖν, *is it not then?*), indicates that the inquirer supports his question on something (οὖν, then, therefore), but is uncertain whether thereby he shall hit the truth. Consequently, this particle conveys some uncertainty, and may be rendered by "perhaps," "it may be": *e.g.*

μῶν τι σε αδικει;
perhaps something injures thee?

So with the negatives, μῶν ου, "does not?" "Yes." μῶν μη, "surely not?" "No."

4. αλλο τι η, forms the direct opposite of μῶν, literally, *is it other than?* which amounts to a strong affirmation; the form intimates that the questioner has hit the right view of the matter, and accordingly expects the opposite (also indicated by αλλο τι) to be unconditionally denied: *s.g.*

αλλο τι η αδικουμεν;
beyond a doubt, we are acting unjustly.

The η is sometimes dropped without a marked alteration in the sense: *e.g.*

αλλο τι; γεωργος μιν εἰς, αλλος δε τις ὑφαντης
the one is a farmer, the other a weaver—is it not so?

5. εἶτα and επειτα, also κᾆτα (και ειτα), and καπειτα, *so then*, represent the question as called forth by something which excites surprise or dissatisfaction in the interrogator, and may often be Englished by, *and now? and yet? what!* e.g.

επειτ' ουκ οιει θεους ανθρωπων φροντιζειν;
and so then, you do not think the gods have care of men?

6. τί μαθων (literally, *learning what?*), τι παθων (literally, *suffering what?*), express dissatisfaction in the fact implied in the question: *e.g.*

τι μαθων καταφρονεις των αμεινονων;
what has taught you to despise your betters?

τι παθοντες αδικειτε τους φιλους;
what has happened to you, that you injure your friends?

Of indirect interrogative sentences the single are introduced by ει, *if, whether*, εαν, αν; and μη, *or not;* and the double by ειτε — ειτε; less frequently by ει — ειτε and ειτε — η, *whether — or.*

In regard to moods, the same rules obtain for interrogative sentences as for affirmative. Consequently the indicative is employed when the questioner inquires after a fact as the basis of an opinion or judgment.

If inquiry is made in regard to a circumstance which the inquirer does not regard as existing, since, in his view, the condition necessary to its existence does not exist, then, in the interrogative sentence, the indicative of the historical tenses with αν, is employed. A sentence thus constructed has its basis in a supposed preliminary sentence, which is commonly expressed, but sometimes is merely understood, or implied from the tenor of what is said: *e.g.*

ει τις σε ηρετο, ὁπως ισωθης, τί αν απεκριναο;
if any asked thee how thou wast saved, what would you answer?

The subjunctive appears in direct questions when a person directs a question to himself, so as to give the idea that he is undetermined as to what opinion he should form of the matter; as,

ιπωμιν η σιγωμεν;
shall we speak, or be silent?

The subjunctive takes αν with it when reference is made to a completely hypothetical foregoing proposition:

πῶς αν οι φρονησαντες ταῦτα καλῶς εχειν ἡγησωνται;
how can the wise consider these things to be in a good condition?

τί ποτ' αν οὖν λιγωμεν;
what, then, should we say?

The optative, in direct questions, denotes the same kind of uncertainty as the subjunctive, only in regard to circumstances which appear as belonging to the past, whereby the matter looks very doubtful for the present: *e.g.*

τι αισχιον αν αισιον ειη;
what could be more shameful and base?

The particle αν, as in the subjunctive, increases the uncertainty: *e.g.*

τίς ουκ αν μαινεσθαι ἡμας νομισειεν;
who would not consider you mad?

In indirect interrogative sentences the employment of the moods is generally governed by the same rules as in direct interrogative sentences. The province of the indirect interrogative is more extended in Greek than in English, for verbs expressive of fear or care take after them a sentence (or clause) of that kind. The mood depends on the tense of the principal verb, and on the degree of doubt or uncertainty; even the indicative may be used after the accompanying μη, if full conviction is intended: *e.g.*

νῦν φοβουμεθα μη αμφοτερων αμα ἡμαρτηκαμιν
now we fear, lest we have at once missed both.

As peculiarities in the construction of interrogative sentences, observe a kind of intermingling of the indirect sentence and the principal sentence: *e.g.*

το των χρηματων, ποσα και ποθιν εσται, μαλιστα ποθειτε ακουσαι
in regard to the question of the money, how much and whence it will be, you very greatly desire to hear.

τους τί ποιουντας το ονομα τοῦτο αποκαλουσιν;
they give this name to persons doing what?

τί τοδ' αγγελλεις;
what is this which you announce?

τίνας τους δ' ὁρῶ ξενους;
who are those strangers whom I see?

Two or more sentences having a common predicate are

sometimes made into one; in translation, you must resolve the compound into its component parts: *e.g.*

τίς τίνος αιτιος εστιν;
who is to blame? and for what is he to blame?

As to negatives in indirect questions, *ου* is employed when you wish to ascertain whether a predicate should be denied of a subject, but *μη* when a doubt is expressed whether a predicate should be annexed to a subject: *e.g.*

αν τουτο γε θανατος ονομαζεται, χωρισμος ψυχῆς απο σωματος;
is not this called death, namely, the separation of the soul from the body?

ποτερον βιαν φῶμεν ειναι, η μη φῶμεν;
should we affirm or not affirm this to be violence?

Our *yes* is represented by the Greek *ναι*, and our *no* by the Greek *ουκ* and *ουχι*; *ναι* and *ουκ*, however, are employed less frequently than the corresponding English particles, since affirmative and negative answers are given by the repetition of some word in the question, or by some other form. You may answer "Yes," by means of adverbs; as, *παυυ, μαλα, μαλιστα, πανταπασι*, mostly in union with *γε* and *και*, which strengthen the affirmative; also with the intensives, *μεν, οὖν, μεντοι, τοι, δῆτα*. As negatives, we find *ουδαμῶς, ηκιστα γε*. An affirmative may also be uttered by *φημι*, or *φημι' εγω*, "granted;" *εστι ταυτα*, "it is so;" *εστιν ουτως*; and a negative, by *ου φημι*, "I deny it."

Repetition is often employed: *e.g.*

ᾔδης τα κηρυχθεντα; *ᾔδη*
didst thou know the proclamation? I knew it.

οἶσθ' οὖν ἁ λεξαι σοι θελω; *ουκ οἶδα*
dost thou know what I wish to say to thee? I do not know.

ουκ ακουετε τοῦ κηρυκος; *ακουομεν*
do you not hear the herald? we hear him.

Sometimes in the answer mere is implied then in the question; that is, the matter asked is affirmed and something is added: *e.g.*

Εσωσα δητα σ' εξεπεμψα τε χθονος; (εσωσας με) ὡστ'
have I indeed saved thee and sent thee from the earth?
εισορᾶν γε φεγγος ἡλιου τοδε
(Yes, thou hast saved me) and sent me to behold this light of the sun.

Imperative Sentences.

An imperative sentence contains an expression of the speaker's will. As this expression is more or less decided, you have either a request or a wish. A request is set forth by the imperative, a wish by the optative. The negative in imperative sentences is the particle *μη*. The imperative of the aorist and the imperative of the present are employed, with this difference, that the imperative of the aorist is used when a strictly single act is intended, and the imperative of the present when continuance or repetition is meant. In the passive, the Greeks have a perfect imperative, by which they expressed a completed and continued condition. To the optative, as expressive of a wish, there may be prefixed the particles *ει* and *εἰθε, O that*.

The imperative, which properly expresses a command, may be used so as to imply a concession or permission (*imperativus concessivus*): *e.g.*

τουτο ιτω ὑπῃ τῳ Θεῳ φιλον
let this take its course as God pleases.

As a representative of the imperative you may, with a softened import, employ the subjunctive: *e.g.*

μηδεν συμφοραν ονιδισῃς
you should not reproach any one with his misfortune.

For the same purpose you may employ the optative without *αν*; *e.g.*

Χειρισοφης ἡγοιτο
Cheirisophos may think.

Also the optative with *αν*, when hesitation is intended. Moreover, the future indicative, when realisation in time to come is meant. Sometimes a question is used instead of a command; as,

ου μ' εασεις;
wont you let me alone?

Exercises.—Greek-English.

Ἀρ' οὖν οἶσθα τινας, οι ανωφιλεῖς οντες ωφελιμους δυνανται φιλους ποιεισθαι; Ποτερα δε ουδενι αρεσαι δυναται Χαιριφων, η εστιν οἷς και παυυ αρεσκει; Τί δη ούτω πρῳ αφῖξαι; Ἀρ' ειμι μαντις; Ἀρα γε ου χρη παντα ανδρα, ἡγησαμενον την εγκρατειαν αριστῆς εἶναι κρηπῖδα, ταυτην πρωτον εν τῃ ψυχῃ κατασκευασασθαι; Ἡ τεθνηκε Πολυβος; Ἡ που κἄμ (και εμε) αποκτεῖναι θελει: Μῶν μη σου αρχουσιν οι διδασκαλοι; Τί οὖν μαθοντες εμαρτυρεῖτε ὑμεις; Αλλο τι η οἱ γε φιλοκιρδῆ ις φιλοῦσι το κερδος; Τίς ανιν αριστῆς μαθοι τι αν αγαθον; Πῶς μεν αν τις ἡττον ὑπο πολεως ζημιοῖτο, πῶς δ' αν μαλλον τιμῷτο, η ει τοῖς νομοις πειθοιτο; Ποτερως αν μαλλον ανθρωποι σωφρονεῖν, αργοῦντες, η των χρησιμων επιμελουμενοι; Τίνα τροπον θαπτωμεν σε, ὦ Σωκρατες; Εφη ὁ Κριτων; Ει τις σε ηρετο· ειπε μοι, μελλεις τιλειν Ἱπποκρατει μισθον ὡς τίνι οντι; Τί αν απεκρινω; Εἰπον αν, ὁτι ὡς ιατρῳ. Ει ετυγχαναν σε ερωτῶν, τίς εστι τῶν ζωγραφων Ζευξις, ει μοι εἶπες, ὁτι ὁ τα ζῶα γραφων, ἀρ' ουκ αν δικαιως σε ηρομην, ὁ τα ποια των ζωων γραφων; Σωκρατης ευχετο προς τους θεους ἁπλῶς ταγαθα διδοναι, ὡς τους θεους καλλιστα ειδοτας ὁποια αγαθα εστι. Ἁ αγαθα και τα κακα ὁποια εστι παντως που γιγνωσκεις. Οἱ των Ἑλληνων στρατηγοι εβουλευοντο ὁπως αν καλλιστα τον παταμον διαβαιην. Σκεψιν ποιωμεθα περι ερωτος, ειτε ωφελειαν, ειτε βλαβην παρεχει. Ὦ Σωκρατες, τίνα γραφην σε γιγραπται ὁ Μελητος; Ἡντινα ους αγεννῆ. ὡς εμοιγε δοκει. Τι αν ποιοῦντες οἱ Αθηναῖοι αναλαβοιεν την αρχαιαν αριστην; Επι ποτεραν με παρακαλεις την θεραπειαν της πολεως; Ὁ μεν φιλῆ, ὁ δε φιλεῖται· ὁποτερος ουν αετῶν ποτερου φιλος εστιν; Τί νομιζεις δῆμον εἶναι; Τους πενητας των πολιτων εγωγε. Εξεστιν ὁν αν τις βουληται τροπον τους θεους τιμᾶν; Ουκ, αλλα νομοι εισι, καθ' οὓς δει τοῦτο ποιειν. Εαν τις σοι καμνῃ τῶν οικιτῶν, τυυτου επιμελῆ και παρακαλεῖς ιατρους, ὁπως μη αποθανῃ; Σοφδρα γε· ουκουν τοῦτα δῆλον ὁτι ειπερ τιμᾶσθαι βουλει, ωφελητεα σοι ἡ πολις εστιν; Παυυ μεν ουν: τίνι γαρ αλλῳ τις αν ειη σοφος, ει γε μη επιστημῃ; Αλλα μην ευνομος γ' ἡ Λακεδαιμων; Πῶς γαρ ου; Ουκουν οἱ γε τα δικαια ποιοῦντες δικαιοι εισι; Τινες γαρ αλλοι; Ἀρα μαλλον αν εβουλου με ὁρᾶν δικαιως η αδικως αποθνησκοντα; Τοιαυτα τίς ανε αν ωκνησε φθεγξασθαι; Φυλαττεσθαι φημι δεῖν μη προφασιν δῶμεν βασιλεῖ; Ὁ Κλεαρχος εφοβεῖτο μη κυκλωθειη αμφοτερωθεν. Θελεις τι μεῖζον η κατακτεῖναι μ' ἑλων; Εγω μιν ουδεν. Και δῆτ' ιτολμας τους δ' ὑπιρβαινειν νομους; (sc. ιτολμα). Ου γαρ τι μοι Ζευς ἡν ὁ κηρυξας ταδε. Ει τινος ετι ενδεεσθαι δοκεῖτε, προς εμε λεγετε, και ει τις ειπῖν τι βουλεται, λεξετω. Θηρα τα καλον, ὦ παι. Βραδεως μεν φιλος γιγνου, γενομενος δε πιρῶ διαμενειν. Ὦ παι, γενοιο πατρος ευτυχεστερος. Μη μοι γενοιθ' ἁ βουλομ', αλλ' ἁ συμφερει. Εἰθε αφανισθειη το κακον εξ ανθρωπων. Ει γαρ γενοιμην, τεκνον, αντι σου νικρος. Ἐξεις ατρεμας;

English-Greek.

Am I a philosopher? Be thou sound-minded. Would he were safe! Young men, seek (hunt) for the beautiful! O boys, may ye be more fortunate than your mother. Be ye quiet. Is your father dead? Surely your father is not dead? Tell me whether your circumstances are good or not. How are you? I knew not how I am. When will the calamity end? I know not when the calamity will end. Which of these two is your brother? Which? Tell me which of the girls is the fairest.

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LESSONS IN ITALIAN GRAMMAR.—No. LII.

SYNTAX.—*Continued.*

OF INDEFINITE PRONOUNS.

Rule 51.—*Alcuno*, some, any one, some people, is sometimes used alone, and sometimes with a substantive; in the latter case, it must agree with it in gender and number.

Examples.

Io veggo alcuno che ci sta ascoltando, I see some one who listens to us
In Persia, quando alcuno vuole onorare il suo amico, egli lo 'nvita a casa sua, in Persia, when any one wishes to honour his friend, he invites him to his house
Alcuni sono li quali, più che l' oltre genti si credono sapere, some are some people who think they know more than other folks, when they know less
Egli è dimorato in Parigi alcun tempo, he has remained some time in Paris
Vi sono andato con alcuni amici, I have been there with some friends

Rule 52.—*Alquanto*, meaning sometime, several, some, is sometimes used alone, and sometimes with a substantive. When it is joined to a substantive, it agrees with it in gender and number.

Examples.

E la, uscita dalla camera, è stata alquanto, tornò dentro piangendo, she went out of the room, and, after some time, she came in with tears in her eyes
La Lauretta con maniera alquanto pietosa cominciò così, Lauretta thus began in a manner rather pathetic
Alquanti, che risentiti, erano all' arme corsi, n' uccisero, they murdered several, who, being awakened, had taken up arms
Dopo alquanto spazio ella a me ritornò, after a little time she came back to me
Alquante lagrime mandate per gli occhj fuori, cominciò ad attendere quello che la gentildonna gli rispondesse, having shed tears, he waited for the lady's answer

Rule 53.—*Altro*, signifying differently, something else, another, etc., may be used alone or with a substantive; in the latter case, it agrees with the substantive in gender and number.

Examples.

Altro avresti detto, se tu m' avessi veduto a Roma, you would have spoken differently, had you seen me at Rome
Sembiante facendo di ridere d' altro, feigning to laugh at something else
Un altro non vi avrebbe perdonato così facilmente, come v' ho perdonato io, another would not have pardoned you as easily as I have done
Datemi un altro bicchiere di quel buon vino, give me another glass of that good wine
Altri tempi, altri costumi, other times, other manners

Rule 54.—*Ciascheduno* and *ciascuno*, meaning every one, each, etc., are used either alone or with substantives. When they are prefixed to substantives, they agree with them in gender, and seldom admit of a plural.

Examples.

Ciascheduno la voleva, every one would have her
La regina comandò che ciascuno s' andasse a riposare, the queen ordered that every one should go to rest
Ciascun paese ha le sue usanze, each country has its customs
Ciascuna scienza ho i suoi principj, every science has its principles
Ciascuno ha i suoi difetti, every one has his faults

Rule 55.—*Nessuno* or *nissuno*, *niuno* or *nullo*, meaning nobody, any one, no one, no, etc., are employed alone or with nouns. If they are united to a noun, they are to agree with it in gender.

Examples.

Nissuno ci vuol quel bene, che io ci voglio, nobody loves you as much as I do
Non ho veduto nessuno, I have not seen any one
Nessuno parlò meco, no one spoke with me
Nissun uomo è infallibile, no man is infallible
Niuna gloria è ad un' aquila aver vinta una colomba, it is no glory for an eagle to overcome a poor dove

Rule 56.—*Ogni*, signifying every, all, is indeclinable. It is put before nouns in the singular, and seldom in the plural.

Examples.

Ogni uomo è soggetto alla critica, every man is liable to censure
Ogni cosa è in Dio, e Dio è in ogni cosa, all is in God, and God is in all
Io vi servirò in ogni occorrenza, I will serve you on every occasion
Ogni re, ogni regina, every king, every queen
Ogni dì, ogni anno, ogni sei mesi, every day, every year, every six months

Rule 57.—*Tutto*, every thing, all, joined to a noun, is liable to gender and number.

Examples.

Gli uomini tutti più a dire che ad operare son pronti, every man is more ready to say than to do
Andate con tutta fretta, go with all speed
Son tutto ghiacciato a morte, I am quite frozen to death
La gente che aveva bontade veniva a lui da tutte parti, good people came to him from every place

OF VERBS.

Rule 58.—Every Verb must agree with its subject, either expressed or understood, in number and person.

Examples.

Io scrivo, I write
Parli da sciocco, thou speakest like a fool
Il cane è fedele, the dog is faithful
Voi parlate troppo forte, you speak too loud
I sarti dicono spesso bugie, tailors often lie

Rule 59.—Two nouns or subjects in the singular, united by *e*, and, require the verb in the plural.

Examples.

L' Austria e la Prussia credevano di terminare da se la bisogna, Austria and Prussia thought to terminate the affair themselves
L' esercizio, e la temperanza rinforzano il temperamento, exercise and temperance strengthen the constitution
Il padre, e la madre sono molto compassionevoli, the father and mother are very compassionate
Mio fratello, e mia sorella sono andati in campagna, my brother and sister are gone to the country
Il ferro, e l' acciaio sono più utili che l' oro e l' argento, iron and steel are more useful than gold or silver

INDICATIVE MOOD.

Present.

Rule 60.—The Italians make use of the Present to express that a thing is, or is doing, at the time in which we speak.

Examples.

Io scrivo una lettera, I am writing a letter
Comparisce l' aurora, the dawn appears
La sobrietà fa vivere lungamente, sobriety makes us live a long time
I fanciulli cantano quand' hanno paura, children sing when they are in fear
La generosità ci guadagna i cuori, generosity gains our hearts

Imperfect.

Rule 61.—The Imperfect is used in Italian to express a past action as present, or going on when another occurred, which is also past.

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Examples.

Io leggeva quando voi siete entratto, I was reading when you came in
Io scriveva una lettera quand' ho ricevuto la vostra, I was writing a letter when I received yours
Noi eravamo ieri a quest' ora vicino a Cambridge, we were yesterday at this time near Cambridge
Io udiva quando mia sorella cantava, I was listening when my sister was singing
Io andava a Roma quand' egli morì, I was going to Rome when he died

Indeterminate Preterite.

Rule 62.—We use the Preterite in Italian to express a particular fact or event which happened at a time specified, and wholly past; as during a particular century, year, month, week, or day.

Examples.

Ho veduto vostro padre il mense passato, I saw your father last month
Ricevei iersera due lettere da mia zia, I received last night two letters from my aunt
Esse partirono la settimana passata, they departed last week
Vennero l' anno passato, they came last year
Cadde morto ieri, he fell dead yesterday

Future.

Rule 63.—The Future is used to denote that an action or event will take place at some future time.

Examples.

Noi lo faremo domani, we shall do it to-morrow
Il conte verrà a pranzare qui la settimana prossima, the count will come to dine here next week
Martedì venturo vi sarà un bellissimo ballo, there will be next Tuesday a very fine ball
Egli ritornerà al suo paese, he will return to his country
Partirò senza di voi, I shall start without you

Conditional Present.

Rule 64.—The Conditional Present denotes that an action or event would take place if certain conditions are fulfilled.

Examples.

Se io avessi danari, comprerei un buon cavallo, if I had money, I would buy a good horse
Lo crederei, se loro le credessero pure, I would believe it, if they were to believe it also
Se potessi, rimarrei nella state in Francia, e nell' inverno in Italia, if I could, I would remain the summer in France and the winter in Italy
Se volessi, potrei farlo, if I would, I could do it
Tacerebbero, se potessero, they would be silent if they could

Subjunctive Mood.

Rule 65.—Verbs expressing command, desire, doubt, fear, ignorance, order, passion, surprise, uncertainty, etc., require the following verb in the Subjunctive.

Examples.

Supplico ch' egli mi legga questo, I entreat him to read me that
Che vuoi tu che io le dica da tua parte? what do you wish me to tell him from you?
Vuoi tu che ti dica il vero? do you wish me to tell you the truth?
Consento ch' egli ami questa donna, I permit him to love that woman
Io voglio ch' egli il faccia, I wish him to do it

Infinitive Mood.

Rule 66.—Italian Infinitives are used as substantives or regimens of a verb, and as second person singular of an imperative negative, and may also be preceded by prepositions.

Examples.

E' proibita il far male, it is forbidden to do evil
Non è civile l' interrompere gli altri quando parlano, it is not polite to interrupt others when they speak
Il suo fare mi piace, his manera please me
Applicatevi alla scrivere ed al parlare, apply yourself to write and to speak
E' tempo di cominciare a parlar Italiano, it is time to begin to speak Italian
Le opere impedite in mezzo all' eseguire, the works stopped in the midst of the execution
Non avere, have not (thou)
Non essere, be not (thou)
Non amare, love not (thou)
Non credere, believe not (thou)
Non servire, serve not (thou)
Questa è un frutto da mangiare, this fruit is good to eat
Mia sorella è andata a passeggiare, my sister is gone to take a walk

Rule 67.—The following verbs have no preposition after them before a following infinitive:—

Bisogna, it is necessary
Convenire, to agree
Dovere, we ought
Fare, to do
Intendere, to intend
Lasciare, to let
Osare, to dare
Parere, to seem
Potere, to be able
Sapere, to know
Sembrare, to seem
Sentire, to hear
Solere, to be accustomed
Vedere, to see
Volere, to choose
Udire, to hear

Examples.

Bisognò subito mandare a cercare il dottore, it was necessary to send for the physician immediately
Debbo parlare, I ought to speak
Che farete mai, se non poteste farlo venire? what would you do, if you could not make him come?
Possono andare al teatro, they may go to the play
Io voglio leggere, I will read

Rule 68.—The following verbs have *di* after them before a following infinitive:—

Abborrire, to abhor
Accadere, to happen
Accennare, to show
Accertare, to assure
Accomandare, to recommend
Accordare, to grant
Accorgersi, to perceive
Affliggersi, to grieve
Ammonire, to admonish
Annojarsi, to be weary
Ardire, to dare
Arrischiare, to venture
Assicurare, to assure
Astenersi, to abstain from
Attentarsi, to attempt
Avvedersi, to perceive
Arventurare, to venture
Avvertire, to admonish
Avvisare, to inform
Badare, to mind
Biasmare, to blame
Bramare, to wish
Cessare, to cease
Cercare, to seek
Chiedere, to ask
Commendare, to commend
Comandare, to command
Commettere, to commit
Conchiudere, concludere, to conclude
Concedere, to grant
Contenersi, to refrain one's self
Consigliare, to advise
Contare, to reckon
Contentarsi, to consent
Convenire, to agree
Credere, to believe
Curarsi, to care
Degnarsi, to deign
Deliberare, to deliberate
Determinare, to determine
Differire, to defer
Dilettarsi, to delight
Dimandare, to ask
Dimenticarsi, to forget
Dire, to tell
Dispensare, to dispense
Dispiacere, to dislike
Dolersi, to grieve
Domandare, to ask
Dubitare, to doubt
Disperare, to despair
Evitare, to avoid
Esitare, to hesitate
Favorire, to be so good as
Fermarsi, to stop
Fingere, to pretend
Finire, to finish
Fissare, to fix
Giurare, to swear
Giudicare, to judge
Gloriarsi, to pride one's self
Godere, to delight
Guardarsi, to beware
Immaginarsi, to imagine
Impedire, to hinder
Imporre, to command
Ingegnarsi, to endeavour
Incaricare, to charge
Increscere, to be sorry
Infingersi, to pretend
Intendere, to understand
Lamentarsi, to complain
Lasciare, to cease
Lusingarsi, to flatter one's self
Mancare, to fail
Meditare, to meditate

Meritare, to deserve
Minacciare, to threaten
Mostrare, to show
Negare, to refuse
Negligentare, to neglect
Obbligare, to oblige
Offrirsi, to offer
Ordinare, to order
Omettere, to omit
Osare, to dare
Parere, to appear
Pensare, to think
Pentirsi, to repent
Permettere, to permit
Piacere, to like
Persuadere, to persuade
Pregare, to entreat
Prescrivere, to prescribe
Presumere, to presume
Pretendere, to pretend
Procurare, to try
Professare, to profess
Proibire, to prohibit
Proporre, to propose
Promettere, to promise
Ricordarsi, to remember
Ricusare, to refuse
Rimproverare, rinfacciare, to reproach
Rincrescere, to be sorry
Ringraziare, to thank
Riprendere, to reprove
Risolvere, to resolve
Scegliere, to choose
Scommettere, to bet
Scongiurare, to conjure
Sconsigliare, to dissuade
Scordarsi, to forget
Scusarsi, to excuse one's self
Sembrare, to seem
Sospirare, to sigh
Sostenere, to support
Sperare, to hope
Svolgere, to dissuade
Supplicare, to entreat
Tentare, to try
Temere, to fear
Tremare, to tremble
Tralasciare, to desist
Vergognarsi, to be ashamed

Examples.

Il padre cercò di dargli moglie, his father sought to give him a wife
Io non son finito di vestire, I have not finished dressing myself
E' pazzo chi presume d'opporsi a chi è più forte, he is a fool who wishes to oppose him who is the strongest
Non mi curo di vederlo, I do not care to see him
Io abborro di far così, I do not like to do it

Rule 69.—The following verbs have *a* after them before a following infinitive:—

Accendere, to excite
Accompagnare, to accompany
Accostumarsi, to accustom
Adescare, to allure
Affrettare, to hasten
Agevolare, to facilitate
Ajutare, to assist
Allettare, to allure
Attendere, to apply one's self
Andare, to go
Aspirare, to aspire
Animare, to animate
Arrivare, to arrive
Avere, to have
Avvezzarsi, to accustom one's self
Avezzare, to accustom
Cominciare, to begin
Condannare, to condemn
Condescendere, to condescend
Condurre, to conduct
Consentire, to consent
Consigliare, to advise
Continuare, to continue
Convenire, to agree
Costringere, to oblige
Darsi, to addict one's self
Disporre, to dispose
Eccitare, to excite
Esortare, to exhort
Esporsi, to expose one's self
Farsi, to become
Giungere, to arrive
Imparare, to learn
Impegnarsi, to pledge
Incoraggire, to encourage
Incitare, to incite
Indurre, to induce
Insegnare, to teach
Intraprendere, to undertake
Mettersi, to set about
Obbligare, to oblige
Obbligarsi, to oblige one's self
Occuparsi, to occupy one's self
Offrirsi, to offer one's self
Ostinarsi, to persist
Pensare, to think about
Persuadere, to persuade
Prepararsi, to prepare one's self
Principiare, to begin
Riuscire, to succeed
Seguire, seguitare, to continue, to follow
Spingere, to urge
Stentare, to work hard
Supplicare, to entreat
Tendere, to tend
Tornare, to return
Venire to come

Examples.

Io mi affretto a partire, I hasten to go away
Egli è in procinto a partire, he is going to dine with him
Cominciarono a dire, Chi è là? they began to say, Who is there?
Niente facendo s'impara a far male, by doing nothing, we learn to do evil
A poco a poco si viene a sapere ogni cosa, little by little, we come to know everything

LESSONS IN SPANISH.—No. XXII.

OF THE CONJUNCTION.

Conjunctions are simple,—that is, such as consist of a single word; or conjunctive phrases, such as consist of more than one word. They may be divided according to their meaning into the following classes:—

1. Copulative, which simply unite words or sentences together; as, *y*, and; *tambien*, also.
2. Disjunctive, which connect words or sentences at the same time that they disjoin the sense; as, *o*, or.
3. Adversative, which express opposition of meaning while they connect; as, *mas*, but; *pero*, but; *sin embargo*, notwithstanding.
4. Comparative, which serve to compare words or propositions; as, *como*, as; *asi*, so; *como si*, as if.
5. Conditional, which express a condition; as, *si*, if; *con tal que*, provided that.
6. Concessive, which serve to express something granted; as, *aunque*, even if; *dado que*, granted that.
7. Conclusive, which express a conclusion or inference; as, *de aqui*, hence; *por esto*, therefore.
8. Causal, which express a cause or reason; as, *porque*, because; *pues que*, since.
9. Temporal, which serve to express a relation of time; as, *antes que*, before; *despues que*, after.
10. Final, which express an end or purpose; as, *para que*, that, in order that; *a fin de que*, to the end that.

MANNER OF USING CERTAIN CONJUNCTIONS.

Sino, meaning *but*, is used after a negative, unless the verb be repeated; and *pero* or *mas*, also meaning *but*, is used when no negative precedes; as,

El reino de Dios no está en palabras, sino en virtud, the kingdom of God is not in word, but in power.
Ella es hermosa, pero (or *mas*) *no es prudente*, she is beautiful, but she is not prudent.

If after a negative the verb be repeated, *pero* or *mas* is to be used instead of *sino*; as,

Ella no lo dijo á Juan, pero (or *mas*) *lo dijo á Pedro*, she did not tell it to John, but she told it to Peter.

Sino, meaning *except*, is used after an interrogation or after a negative; and *menos*, also meaning *except*, is used when no interrogation or negative precedes; both words being rendered in English by *but*; as,

¿Quién lo hizo sino el carpintero? who did it but the carpenter?
Ninguno hay bueno sino solo Dios, there is no one good but God alone.
Vinieron todos menos el juez, they all came but the judge.

The conjunction "but" is used in English with such a variety of meanings that it is necessary, before rendering it into Spanish, to find what other word or words it really represents, as this latter word or phrase is generally that which is used to represent it in Spanish; thus,

I am distant from death but (only) one step, *un solo paso dista yo de la muerte.*
We have but (no more than) five loaves and two fishes, *no tenemos mas de cinco panes y dos peces.*
He arrived but (not till) yesterday, *no llegó hasta ayer.*
I cannot but (do less than) go, *yo no puedo menos de ir.*
He has but (done no more than) gone (i.e. he has but just gone), *el no ha hecho mas que irse.*
But (if it were not) for me, he would perish, *si no fuese por mi, el pereceria.*
There is no one of them but (who is not) is a general, *no hay ninguno de ellos que no sea general.*
He went no day to the village but (that not) he returned drunk, *ninguno dia fué al lugar que no volvió borracho.*

It will at once be perceived that the irregularity in the use of the word "but" is chargeable to the English, not the

Spanish language. In the latter, "but" is not used with ten different meanings as in English.

The conjunction "unless" is to be rendered in Spanish by *á ménos de que*, or by the word or words which it really represents; as,

He will do nothing unless you speak (may-speak) to him, *nada hará, á ménos de que vmd. le hable.*
No one can do these miracles unless (if not) God be (should be) with him., *ninguno puede hacer estos milagros, si Dios no estuviere con él.*

The conjunction "except," when it means the same as "unless," is rendered in Spanish in the same manner; and when it means privation, as, for instance, in the sentence, I bought all his books except the histories, it is rendered by *ménos*, less, minus.

The conjunction "whether" is to be rendered in Spanish by *si* or *que*, and sometimes by the subjunctive of the verb *ser*, as,

I doubt whether (that) thou hast any oil, *dudo que tengas aceite.*
I asked him whether (if) his mother would come, *le pregunté si su madre vendria.*
Whether he may have grapes or not, is nothing to me, *Que tenga uvas ó no, nada me importa.*
Whether it rains, or whether it does not rain, *que llueva ó que no llueva.*
Whether or not we may be (let us be or not) worthy of such an honour, *seamos ó no dignos de tal honra.*

The conjunction "as" is rendered by *como*, when used by way of comparison; by *así como*, when followed by "so;" by *cuando*, when it means "when;" and after *mismo* by *que;* as,

John is as[4] strong as a lion, *Juan es tan fuerte como un leon.*
As modesty attracts, so dissoluteness repels, *así como la modestia atrae, así huye la disolucion.*
He saw her as (when) he was going home, *la vió cuando iba á casa.*
It is not the same to promise as to fulfil, *no es lo mismo prometer que cumplir.*

The conjunction "neither," followed by "nor," is rendered in Spanish by *ni;* and "nor" also by the same word; as,

Swear not, neither by heaven, nor by the earth, nor any other oath, *no jurés, ni por el cielo, ni por la tierra, ni otro juramento alguno.*

At the end of a sentence, "neither," and also "either," if preceded by a negative, are rendered by *tampoco;* as,

She will not do it, nor has either (or neither), *ella no quiere hacerla, ni él tampoco.*

The conjunction "either," followed by "or," is rendered in both cases by *ó*, as,

Either he is a knave or he is a fool, *ó es pícaro ó es tonto.*

The conjunction "both," followed by "and," is rendered by *así* or *tanto*, and the "and" by *como;* as,

Both in time of peace and in time of war, *tanto en tiempo de paz, como en tiempo de guerra.*
Both John and James will be here, *así Juan como Diego estarán aquí.*

These examples might be rendered by, as well as; thus, "in time of peace as well as in time of war;" "John as well as James will be here."

The conjunction "lest," when it means, for fear that, is rendered by *no sea que;* when it means, in order that not, by *para que no;* and when it means simply, that not, by *que no;* as,

Thou wilt accompany him to his house directly, lest any accident may happen to him, *tú le acompañarás á su casa al instante, no sea que le suceda algun fracaso.*
Love not sleep, lest want may oppress thee, *no ames el sueño, para que no te oprima la indigencia.*
We were careful lest you should awake, *cuidábamos de que no se despertase vmd.*

The conjunction "rather," when used in the sense of "but," is rendered by *dales* or *antes bien;* as,

I do not owe him anything; rather he owes me something, *yo no le debo nada, antes bien él me debe algo.*

[4] The first "as" is here an adverb, qualifying the adjective "strong."

THEORY AND PRACTICE OF TEACHING.

No. VII.

PROPER INCENTIVES.

In what has already been said, it has been been more than hinted that there are higher attributes than emulation, which the teacher should address, and which, if he is successful in calling them into exercise, will be quite sufficient to ensure the proper application of his pupils to their studies. They have the merit, moreover, of being safe. They do not unduly stimulate the intellectual at the expense of the moral faculties. Their very exercise constitutes a healthy growth of the moral nature. Some of these we may briefly allude to.

1. A DESIRE TO GAIN THE APPROBATION OF THEIR PARENTS AND TEACHER. The love of approbation is as universal in the human mind as emulation. Not one in a thousand can be found who does not possess it. Within proper limits, it is a desirable trait in human character. It is, to be sure, one of the selfish propensities; but among them all, it is the most innocent. Carried to an extreme, it would lead its possessor to crave the good opinion of the bad as well as of the good, and to become an obsequious seeker after popularity. This, of course, is to be deprecated. But there can be no danger of this extreme, as long as the approbation of *parents* and *teachers* is the object aimed at. It implies in the child a respect for the opinions, and a confidence in the justice of his parents and teachers; and hence it implies in him a generous desire to please as a condition of being commended by them.

In this sense, the love of approbation may be appealed to by the teacher. He perhaps need not frequently use the language of praise. It will generally be sufficient, if the smile of approval beams forth in his countenance. If he is judicious as well as just, this boon soon becomes a precious one to the child. It is a reward, moreover, which

"is twice blest;
It blesseth him who gives and him who takes."

II. A DESIRE OF ADVANCEMENT. This is emulation in its *good* sense. It leads the child, as before remarked, to compare his present standing and attainments with what they should be, and to desire to surpass himself. This is ever commendable. Man was made for progress; and it is no unworthy aspiration when this desire fires the youthful breast. The teacher, then, may appeal to this desire, may kindle it into a flame even with safety,—because it is a flame that warms without consuming that on which it feeds.

III. A DESIRE TO BE USEFUL. The good teacher should never fail to impress upon the child that the object of his being placed on earth was, that he might be of some use to the world by which he is surrounded. "No man liveth to himself, and no man dieth to himself." He can be thus useful by storing the mind with knowledge and the heart with right affections. He may be reminded of the connection between his present studies and the pursuits of life to which they may be applied. Some judicious hint at the future application of any branch is always a good preparation of the mind to pursue it. If there is a definite object in view, there will always be more alacrity in the labour of study; and this may be made to influence the young pupil as well as the more advanced. It is no small

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thing for the child if he can be early made to feel that he is living to some purpose.

IV. A DESIRE TO DO RIGHT. This, in other words, is a disposition to obey conscience by conforming to the will of God. This indeed is the highest and holiest of all the motives to human action. In its fullest sense it constitutes the fundamental principle of a religious character. The teacher should most assiduously cultivate in the child a regard for this principle. God has implanted the conscience in every child of earth, that it should early be made use of to regulate the conduct. That teacher is either grossly ignorant or madly perverse, who disregards the conscience, while he appeals alone to the selfishness of the young, and thus practically teaches that moral obligation is a nullity; that the law of God —so beautifully expounded by the Saviour—"Thou shalt love the Lord thy God with all thy heart, and with all thy soul, and with all thy mind," and "Thou shalt love thy neighbour as thyself"—is of little consequence; and that the injunction of the apostle—"Whether ye eat or drink, or whatsoever ye do, do all to the glory of God," is as good as obsolete.

In early childhood the conscience is most active. It needs, to be sure, at that period to be enlightened; but if the teachings of Revelation are made plain to the child, he seldom disregards them. The teacher has at this period very much to do, as we have before said under the head of the Responsibility of Teachers; and he cannot neglect his duty without the most aggravated culpability. The point we urge here is, that he should use these motives as *incentives to study*. The child can be made to feel that he owes the most diligent efforts for improvement to his teacher, who daily labours for his improvement; to his parents, who have kindly supplied his wants, and have provided the means for his cultivation; to society, whose privileges he may enjoy, and to which he is bound to make a return by becoming an intelligent and useful member of it; to himself, as a rational and immortal being, capable of unbounded enjoyment or untold misery, just in proportion as he prepares himself for either; and above all to his CREATOR, by whose bounty he lives, surrounded with friends and blessed with opportunities, which are denied to millions of his fellow-beings,—by whose gracious providence he has been endowed with faculties and capabilities making him but little lower than the angels, and which he is bound to cultivate for usefulness and for heaven,—by whose mercy he has been supplied, as millions have not, with the word of God, to guide his mind to things above, and with the influences of Christian society, to cheer him in his path to heaven;—above all, we repeat, should the child be taught to feel that he owes to God his best efforts to make the most of all his powers for time and eternity. If this can be done (and we believe to a great extent it can be done), there will be no need of a resort to those questionable incentives found in exciting children to outstrip their fellows by prizes and rewards; while in this very process the foundation of a good moral training will be laid, without which the perfect structure of a noble character can never be reared in later life.

To the motives already alluded to, if it be necessary to add another, we would urge.

V. THE PLEASURE OF ACQUISITION. This is often underrated by teachers. Our Creator has not more universally bestowed a natural appetite for the food which is necessary for the growth of the body, than he has a mental longing for the food of the mind; and as he has superadded a sensation of pleasure to the necessary act of eating, so he has made it a law of the mind to experience its highest delight while in the act of receiving the mental aliment. Whoever has observed childhood with an attentive eye, must have been impressed with the wisdom of God in this arrangement. How much the child acquires within the first three years after its birth! He learns a difficult language with more precision than a well-educated adult foreigner could learn it in the same time; yet language is not his only or his chief study. During these same three years, he makes surprising advances in general knowledge. He seeks an intimate acquaintance with all the physical objects by which he is surrounded. The size, form, colour, weight, temperature, and use of each are investigated by the test of his own senses or ascertained by innumerable inquiries. His ideas of height and distance, of light and heat, of motion and velocity, of cause and effect, are all well defined. He has made no mean attainments in morals. He comprehends the law of right and wrong, so that his decisions may well put to the blush his superiors in age; and unless grossly neglected, he has learned the duty of obedience to parents and reverence towards God. Now all this amazing progress has been made because of the irrepressible curiosity with which God has endowed him, and the unspeakable delight he experiences in acquiring the knowledge which gratifies it.

All must have noticed the delight with which the child grasps a new idea; but few have been able to describe it so eloquently as it is done by Mr. Mann. "Mark a child," says he, "when a clear, well-defined, vivid conception seizes it. The whole nervous tissue vibrates. Every muscle leaps. Every joint plays. The face becomes auroral. The spirit flashes through the body like lightning through a cloud.

"Observe, too, the blind, the deaf, and the dumb. So strong is their inborn desire for knowledge,—such are the amazing attractive forces of their minds for it, that although the natural inlets, the eye and the ear, are closed, yet they will draw it inward through the solid walls and enclosements of the body. If the eye be curtained with darkness, it will enter through the ear. If the ear be closed in silence, it will ascend along the nerves of touch. Every new idea that enters into the presence of the sovereign mind, carries offerings of delight with it to make its coming welcome. Indeed our Maker created us in blank ignorance, for the very purpose of giving us the boundless, endless pleasure of learning new things."

It is of course not to be expected that the same degree of pleasure will attend the learner in every acquisition as the novelty diminishes, and as he advances in age. The bodily appetite is less keen in after life than in childhood, so that the adult may never realize again to the full extent the delicious flavours which regaled him in his earliest years. Still there will ever be a delight in acquisition; and to carry our illustration a little further,—as the child is soonest cloyed whose stomach is surfeited with dainties, and stimulated with condiments, and pampered with sweetmeats, till his taste has lost its acumen, and digestion becomes a burden; so the mental appetite is soonest destroyed, when, under the unskilful teacher, it is overloaded with what it can neither digest nor disgorge. The mind may be surfeited; and then no wonder if it loaths even the wholesome aliment. Artificial stimulants, in the shape of prizes, and honours, and flattery, and fear, and shame, may have impaired its functions, so that it ceases to act except under their excitement. But all must see that these are unnatural conditions, superinduced by erroneous treatment. *There is still a delight in acquisition*, just as soon as the faculties are aroused to the effort; and the skilful teacher will strive to *wake up the mind* to find this delight,—and if he understands his work, he will scarcely need a stronger incentive. If he understands the secret of giving just so much instruction as to excite the learner's curiosity, and then to leave him to discover and acquire for himself, he will have no necessity to use any other means as stimulants to exertion.

To this might be added that *irrepressible curiosity*, that all-pervading *desire to know*, which is found in the mind of every child. The mind, as if conscious of its high destiny, instinctively spreads its unfledged wings in pursuit of knowledge. This, with some children, is an all-sufficient stimulant to the most vigorous exertion. To this the teacher may safely appeal. Indeed, it is a convincing proof of the wisdom as well as the goodness of God, that this *desire to know*, as well as the *delight of acquisition*, are the most active at that early period of childhood, when a just appreciation of the utility of knowledge, and the higher motives already detailed, could scarcely find a lodgment in the tender mind. It seems to be, therefore, an indispntable dictate of our very nature, that both these principles should be early employed as incentives.

If, then, *the desire of the approval of parents and teachers,—the desire of advancement,—the desire to be useful,—and the desire to do right*, can be superadded to the *natural love in the child for acquisition and a natural desire to know*, there will, as we believe, be but little occasion to look further for incentives to exertion in the pupil; and we may venture to add, as a *scholium* to what has already been said, that the teacher who has

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not yet learned to call into exercise these higher motives, and to rely for success mainly upon them, and who dares not abandon the system of exciting stimulants for fear of a failure, *has yet much to learn as a true educator of the young.*

SCHOOL GOVERNMENT.

It is not necessary that much space should be occupied in speaking of the importance of order in our schools. Everybody who has written or spoken on this subject, has conceded the necessity of obedience on the part of the pupil. "ORDER IS HEAVEN'S FIRST LAW;" and it is scarcely more essential to the harmony of heaven, than it is to the happiness and success of the school.

If such be the necessity of order in the school, then he ability to secure and maintain it is no mean part of the *qualification* of the good teacher. It is lamentable that so many fail in this particular; and yet this frequent failure can in most cases be traced to some defect in the constitutional temperament, or some deficiency in the mental or moral culture of the teacher himself.

LESSONS IN READING AND ELOCUTION.

No. XXIX.

EXCELLENCE OF THE HOLY SCRIPTURES.

Is it bigotry to believe the sublime truths of the Gospel with full assurance of faith? I glory in such bigotry. I would not part with it for a thousand worlds. I congratulate the man who is possessed of it: for, amidst all the vicissitudes and calamities of the present state, that man enjoys an inexhaustible fund of consolation, of which it is not in the power of fortune to deprive him.

There is not a book on earth so favourable to all the kind, and all the sublime affections; or so unfriendly to hatred and persecution, to tyranny, to injustice, and every sort of malevolence, as the Gospel. It breathes nothing throughout, but mercy, benevolence, and peace.

Poetry is sublime, when it awakens in the mind any great and good affection, as piety or patriotism. This is one of the noblest effects of the art. The Psalms are remarkable, beyond all other writings, for their power of inspiring devout emotions. But it is not in this respect only that they are sublime. Of the divine nature, they contain the most magnificent descriptions that the soul of man can comprehend. The hundred-and-fourth Psalm, in particular, displays the power and goodness of Providence, in creating and preserving the world, and the various tribes of animals in it, with such majestic brevity and beauty, as it is vain to look for in any human composition.

Such of the doctrines of the Gospel as are level to human capacity, appear to be agreeable to the purest truth and the soundest morality. All the genius and learning of the heathen world—all the penetration of Pythagoras, Socrates, and Aristotle, had never been able to produce such a system of moral duty, and so rational an account of Providence and of man, as are to be found in the New Testament. Compared, indeed, with this, all other moral and theological wisdom

Loses, discountenanced, and like folly shows.

Beattie.

CRESCENTIUS.

I looked upon his brow,—no sign
 Of guilt or fear was there;
He stood as proud by that death-shrine,
 As even o'er despair
He had a power; in his eye
There was a quenchless energy,
 A spirit that could dare
The deadliest form that death could take,
And dare it for the daring's sake.

He stood, the fetters on his hand,—
 He raised them haughtily;
And had that grasp been on the brand,
 It could not wave on high
With freer pride than it waved now.
Around he looked with changeless brow
 On many a torture nigh,—
The rack, the chain, the axe, the wheel,
And, worst of all, his own red steel.

I saw him once before; he rode
 Upon a coal-black steed,
And tens of thousands thronged the road,
 And bade their warrior speed.
His helm, his breastplate, were of gold,
And graved with many a dint, that told
 Of many a soldier's deed;
The sun shone on his sparkling mail,
And danced his snow-plume on the gale.

But now he stood, chained and alone,
 The headsman by his side;
The plume, the helm, the charger gone;
 The sword, that had defied
The mightiest, lay broken near,
And yet no sign or sound of fear
 Came from that lip of pride;
And never king or conqueror's brow
Wore higher look than his did now.

He bent beneath the headsman's stroke,
 With an uncovered eye:
A wild shout from the numbers broke
 Who thronged to see him die.
It was a people's loud acclaim,
The voice of anger and of shame,
 A nation's funeral cry,—
Rome's wail above her only son,
Her patriot,—and her latest one.—*Miss Landon.*

RECTITUDE OF CHARACTER.

The man who is so conscious of the rectitude of his intentions, as to be willing to open his bosom to the inspection of the world, is in possession of one of the strongest pillars of a decided character. The course of such a man will be firm and steady, because he has nothing to fear from the world, and is sure of the approbation and support of Heaven. While he who is conscious of secret and dark designs, which, if known, would blast him, is perpetually shrinking and dodging from public observation, and is afraid of all around, and much more of all above him.

Such a man may, indeed, pursue his iniquitous plans steadily; he may waste himself to a skeleton in the guilty pursuit; but it is impossible that he can pursue them with the same health-inspiring confidence, and exulting alacrity, with him who feels, at every step, that he is in pursuit of honest ends by honest means.

The clear, unclouded brow, the open countenance, the brilliant eye which can look an honest man steadfastly, yet courteously, in the face, the healthfully beating heart, and the firm, elastic step, belong to him whose bosom is free from guile, and who knows that all his motives and purposes are pure and right. Why should such a man falter in his course? He may be slandered; he may be deserted by the world; but he has that within which will keep him erect, and enable him to move onward in his course, with his eyes fixed on Heaven, which he knows will not desert him.

Let your first step, then, in that discipline which is to give you decision of character, be the heroic determination to be honest men, and to preserve this character through every vicissitude of fortune, and in every relation which connects you with society. I do not use this phrase, "honest men," in the narrow sense, merely, of meeting your pecuniary engagements, and paying your debts; for this the common pride of gentlemen will constrain you to do.

I use it in its larger sense of discharging all your duties, both public and private, both open and secret, with the most scrupulous, Heaven-attesting integrity: in that sense, farther,

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which drives from the bosom all little, dark, crooked, sordid, debasing considerations of self, and substitutes in their place a bolder, loftier, and nobler spirit: one that will dispose you to consider yourselves as born, not so much for yourselves, as for your country, and your fellow-creatures, and which will lead you to act, on every occasion, sincerely, justly, generously, magnanimously.

There is a morality on a larger scale, perfectly consistent with a just attention to your own affairs, which it would be the height of folly to neglect; a generous expansion, a proud elevation, and conscious greatness of character, which is the best preparation for a decided course, in every situation into which you can be thrown: and it is to this high and noble tone of character that I would have you to aspire.

I would not have you to resemble those weak and meagre streamlets, which lose their direction at every petty impediment that presents itself, and stop, and turn back, and creep around, and search out every little channel through which they may wind their feeble and sickly course. Nor yet would I have you to resemble the headlong torrent that carries havoc in its mad career.

But I would have you like the ocean, that noblest emblem of majestic Decision, which in the calmest hour still heaves its resistless might of waters to the shore, filling the heavens, day and night, with the echoes of its sublime Declaration of Independence, and tossing and sporting on its bed, with an imperial consciousness of strength that laughs at opposition. It is this depth, and weight, and power, and purity of character, that I would have you to resemble; and I would have you, like the waters of the ocean, to become the purer by your own action.—*William Wirt.*

ADDRESS TO THE OCEAN.

O thou vast Ocean! ever-sounding sea!
Thou symbol of a drear immensity!
Thou thing that windest round the solid world
Like a huge animal, which, downward hurled
From the black clouds, lies weltering and alone,
Lashing and writhing till its strength be gone.
Thy voice is like the thunder; and thy sleep
Is like a giant's slumber, loud and deep.
Thou speakest in the east and in the west
At once; and on thy heavily laden breast
Fleets come and go, and shapes that have no life
Or motion, yet are moved and meet in strife.
The earth hath naught of this; nor chance nor change
Ruffles its surface; and no spirits dare
Give answer to the tempest-waken air;
But o'er its wastes, the weakly tenants range
At will, and wound his bosom as they go.
Ever the same, it hath no ebb, no flow,
But in their stated round the seasons come
And pass like visions to their viewless home,
And come again and vanish: the young Spring
Looks ever bright with leaves and blossoming,
And Winter always winds his sullen horn,
And the wild Autumn with a look forlorn
Dies in his stormy manhood; and the skies
Weep, and flowers sicken when the Summer flies.
—— Thou only, terrible Ocean, hast a power,
A will, a voice; and in thy wrathful hour.
When thou dost lift thine anger to the clouds,
A fearful and magnificent beauty shrouds
Thy broad green forehead. If thy waves be driven
Backwards and forwards by the shifting wind,
How quickly dost thou thy great strength unbind,
And stretch thine arms, and war at once with heaven!

Thou trackless and immeasurable main!
On thee no record ever lived again
To meet the hand that writ it; line nor lead
Hath ever fathomed thy profoundest deeps,
Where happily the huge monster swells and sleeps,
King of his watery limit, who, 'tis said,
Can move the mighty ocean into storm.—
O! wonderful thou art, great element;
And fearful in thy spleeny humours bent,
And lovely in repose: thy summer form
Is beautiful; and when thy silver waves
Make music in earth's dark and winding caves,
I love to wander on thy pebbled beach,
Marking the sunlight at the evening hour,
And hearken to the thoughts thy waters teach,—
"Eternity, Eternity, and power."—*Barry Cornwall.*

THE BIBLE.

The Bible is the only book which God has ever sent, the only one he will ever send, into this world. All other books are frail and transient as time, since they are only the registers of time; but the Bible is durable as eternity, for its pages contain the records of eternity. All other books are weak and imperfect, like their author, man; but the Bible is a transcript of infinite power and perfection. Every other volume is limited in its usefulness and influence; but the Bible came forth conquering and to conquer: rejoicing as a giant to run his course, and like the sun, "there is nothing hid from the heat thereof." The Bible only, of all the myriads of books the world has seen, is equally important and interesting to all mankind. Its tidings, whether of peace or of woe, are the same to the poor, the ignorant, and the weak, as to the rich, the wise, and the powerful.

Among the most remarkable of its attributes is justice; for it looks with impartial eyes on kings and on slaves, on the hero and the soldier, on philosophers and peasants, on the eloquent and the dumb. From all, it exacts the same obedience to its commandments, and promises to the good, the fruits of his labours; to the evil, the reward of his hands. Nor are the purity and holiness, the wisdom, benevolence and truth of the Scriptures less conspicuous than their justice. In sublimity and beauty, in the descriptive and pathetic, in dignity and simplicity of narrative, in power and comprehensiveness, depth and variety of thought, in purity and elevation of sentiment, the most enthusiastic admirers of the heathen classics have conceded their inferiority to the Scriptures.

The Bible, indeed, is the only universal classic, the classic of all mankind, of every age and country, of time and eternity, more humble and simple than the primer of a child, more grand and magnificent than the epic and the oration, the ode and the drama, when genius with his chariot of fire, and his horses of fire, ascends in whirlwind into the heaven of his own invention. It is the best classic the world has ever seen, the noblest that has ever honoured and dignified the language of mortals.

If you boast that the Aristotles, and the Platos, and the Tullies, of the classic age "dipped their pens in intellect," the sacred authors dipped theirs in inspiration. If those were the "secretaries of nature," these were the secretaries of the very Author of nature. If Greece and Rome have gathered into their cabinet of curiosities the pearls of heathen poetry and eloquence, the diamonds of Pagan history and philosophy, God himself has treasured up in the Scriptures, the poetry and eloquence, the philosophy and history of sacred lawgivers, of prophets and apostles, of saints, evangelists, and martyrs. In vain may you seek for the pure and simple light of universal truth in the Augustan ages of antiquity. In the Bible only is the poet's wish fulfilled,—

"And like the sun be all one boundless eye."

Grimké.

THE DOWNFALL OF POLAND.

O sacred Truth! thy triumph ceased a while,
And Hope, thy sister, ceased with thee to smile,
When leagued Oppression poured to Northern wars
Her whiskered panders and her fierce hussars,
Waved her dread standard to the breeze of morn,
Pealed her loud drum, and twanged her trumpet horn;
Tumultuous horror brooded o'er her van,
Presaging wrath to Poland,—and to man!

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Warsaw's last champion from her height surveyed,
Wide o'er the fields a waste of ruin laid,—
O Heaven! he cried, my bleeding country save!
Is there no hand on high to shield the brave?
Yet, though destruction sweep these lovely plains,
Rise, fellow-men! our country yet remains!
By that dread name, we wave the sword on high!
And swear for her to live!—with her to die!

He said, and on the rampart-heights arrayed
His trusty warriors, few, but undismayed:
Firm-paced and slow, a horrid front they form,
Still as the breeze, but dreadful as the storm:
Low murmuring sounds along their banners fly,
'Revenge, or death,'—the watch-word and reply;
Then pealed the notes, omnipotent to charm,
And the loud tocsin told their last alarm!

In vain, alas! in vain, ye gallant few!
From rank to rank your volleyed thunder flow:
Oh! bloodiest picture in the book of Time,
Sarmatia fell, unwept, without a crime;
Found not a generous friend, a pitying foe,
Strength in her arms, nor mercy in her woe:
Dropped from her nerveless grasp the shattered spear,
Closed her bright eye, and curbed her high career;
Hope, for a season, bade the world farewell,
And Freedom shrieked—as Kosciusko fell.

The sun went down, nor ceased the carnage there;
Tumultuous murder shook the midnight air,—
On Prague's proud arch the fires of ruin glow,
His blood-dyed waters murmuring far below;
The storm prevails, the rampart yields away,
Bursts the wild cry of horror and dismay!
Hark! as the mouldering piles with thunder fall,
A thousand shrieks for hopeless mercy call!
Earth shook,—red meteors flashed along the sky,
And conscious Nature shuddered at the cry!

O righteous Heaven! ere Freedom found a grave,
Why slept the sword, omnipotent to save?
Where was thine arm, O vengeance! where thy rod,
That smote the foes of Sion and of God;
That crushed proud Ammon, when his iron car
Was yoked in wrath, and thundered from afar?
Where was the storm that slumbered till the host
Of blood-stained Pharaoh left their trembling coast;
Then bade the deep in wild commotion flow,
And heaved an ocean on their march below?

Departed spirits of the mighty dead!
Ye that at Marathon and Leuctra bled!
Friends of the world! restore your swords to man,
Fight in his sacred cause, and lead the van!
Yet for Sarmatia's tears of blood atone,
And make her arm puissant as your own!
Oh! once again to freedom's cause return
The patriot Tell,—the Bruce of Bannockburn!

Yes, thy proud lords, unpitied land! shall see
That man hath yet a soul,—and dare be free!
A little while, along thy saddening plains,
The starless night of Desolation reigns;
Truth shall restore the light by Nature given,
And, like Prometheus, bring the fire of Heaven!
Prone to the dust Oppression shall be hurled,
Her name, her nature, withered from the world!

Thomas Campbell.

THE LOVE OF TRUTH.

Truth is the one legitimate object of all intellectual endeavour. To discover and apprehend truth, to clear up and adorn it, to establish, and present, and commend it,—these are the processes and the ends of study and literature. To discern the things that really are, and how they are, to distinguish reality from appearance and sham, to know and declare the truth in outward nature, in past time, in the results of speculation, in consciousness and sentiment,—this is the business of educated mind. Logic and the mathematics are instruments for this purpose, and so is the imagination just as strictly. A poem, a play, a novel, though a work of fiction, must be true, or it is a failure. Its machinery may be unknown to the actual world; the scene may be laid in Elysian fields, or infernal shades, or fairy land; but the law of truth must preside over the work; it must be the vehicle of truth, or it is nought, and is disallowed. The Tempest, the Odyssey, and Paradise Lost, derive their value from their truth; and I say this, not upon utilitarian principles, but according to the verdict which every true soul passes upon them, consciously or unconsciously. Lofty, holy truth, made beautiful and dear and winning to the responsive heart,—this is their charm, their wealth, their immortality. There is no permanent intellectual success but in truth attained and brought home to the eye, the understanding, or the heart.

And for the best success in the pursuit of any object there must be a *love* of the object itself. The student, the thinker, the author, who is true to his vocation, *loves* the truth which he would develope and embody. Not for bread, not for fame, primarily, he works. These things may come, and are welcome; but truth is higher and dearer than these. Great things have been done for bread and fame, but not the greatest. Plato, pacing the silent groves of the academy, and Newton, sitting half a day on his bedside, undressed, and his fast unbroken, rapt in a problem of fluxions; Dante solacing the bitterness of exile with the meditations that live in the Commedia, and Bacon taking his death chill in an experiment to test the preserving qualities of snow; Cuvier, a lordlier Adam than he of Eden, naming the whole animal world in his museum, and reading the very thoughts of God after him in their wondrous mechanism; Franklin and Davy wresting the secrets of nature from their inmost hiding-place; Linnæus studying the flora of the arctic circle *in loco*; and that fresh old man who startles the clefts of the Rocky Mountains with his rifle, to catch precisely the lustrous tints of beauty in the plumage of a bird;—these men, and such as they, love truth, and are consecrate, hand and heart, to her service. The truth as she stands in God's doings, or in man's doings, or in those thoughts and affections that have neither form nor speech, but which answer from the deep places of the soul,—truth, as seen in her sublimities or her beauties, in her world-poising might or her seeming trivialities,—truth, as she walks the earth embodied in visible facts, or moves among the spheres in the mysterious laws that combine a universe and spell it to harmony, or as she sings in the upper heavens the inarticulate wisdom which only a profound religion in the soul can interpret,—truth, in whichsoever of her myriad manifestations she has laid hold of noble affinities, and brought their being into holy captivity;—such men have loved her greatly and fondly; the soul of genius is always pledged to her single-hearted and sweet affiance, or else it is genius baffled, blasted, and discrowned.—*George Putnam.*

ANSWERS TO CORRESPONDENTS.

J. F.—Apply to the Registrar of the London University.

L. Q.—The "Youth's Educator" contains some excellent lessons in arithmetic, put in a very plain and interesting form.

NED.—The system of Short-hand given in these pages is, in our opinion, the best.

A SUBSCRIBER.—You can only get admission as a reader at the British Museum by obtaining a ticket, granted by the librarian on the recommendation of some respectable householder.

YOUNG STUDENT.—Great things have been said about the wonderful manner in which Milton communicated instruction. In his letters to Hartlet, he enumerates "rational studies" for young gentlemen between twelve and twenty, which include grammar, arithmetic, agriculture, natural history, geometry, astronomy, geography, fortification, architecture, engineering, navigation, &c., ethics, theology, politics, law, French, Italian, Latin, Greek, Hebrew, Chaldee, and Syriac. The outline is amply sufficient to satisfy the most ambitious student. We should advise you to be less discursive. Take Latin and Geometry, work at them thoroughly; all the other studies in the POPULAR EDUCATOR will be comparatively easy, if you master these.

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ON PHYSICS, OR NATURAL PHILOSOPHY.
No. LXXVIII.

(*Continued from page* 387.)

METEOROLOGY.—LUMINOUS METEORS.

Aurora Borealis—The name *aurora borealis*, or eether *aurora polaris*, is applied to an extremely remarkable phenomenon which often appears in the atmosphere at the two poles. When it appears at the north pole, it is called *aurora borealis*, or, in popular language, the northern lights, and when it appears at the south pole, it bears the name of *aurora australis*. The *aurora borealis* appears more frequently than the *aurora australis*, but the reason is, probably, because there are more persons to observe in the northern than in the southern regions. We extract from the Treatise on Meteorology, by Messrs. Becquerel, the following description of an *aurora borealis*, as observed at Bossekop, in Norwegian Lapland, at 70 degrees north latitude, in the winter of 1838-9.

In the evening, between four and eight o'clock, the fog, which usually prevails north of Bossekop, becomes coloured in the upper part. This light gradually gets more regular, and forms a sort of arch of a pale yellow colour, with its concave side towards the earth and its highest point apparently in the magnetic meridian.

Before long, blackish stripes in regular order separate the luminous parts of the arch. Luminous rays are formed, which lengthen or become shorter, slower or instantaneously, their brightness increasing and diminishing suddenly. The lower ends of these rays always exhibit the brightest light, and form an arch of more or less regularity. The length of the rays is very varied, but all converge towards one point in the sky, which is indicated by the prolongation of the southern extremity of the inclination needle. Sometimes the rays are prolonged till they meet, and thus form the fragment of a luminous cupola.

The arch continues to ascend towards the zenith, exhibiting an undulating motion in its light. Sometimes one of its feet, and even both, are separated from the horizon. The folds are then more distinct and more numerous. The arch is nothing more than a long band or strip of rays, which are twisted and separated in several parts, forming graceful curves, which wind about and present the appearance known by the name of the *corona borealis*, or northern wreath, fig. 489. The brightness of the rays, varying suddenly in intensity, reaches that of stars of the first magnitude, the rays dart with rapidity, and the curves form and unfold like the coils of a serpent. Then the rays become coloured; the lower part is red, the middle green, and the remainder retains its clear yellow tint. At last the brightness diminishes, the colours disappear, and the whole becomes gradually indistinct, or suddenly vanishes. Scientific observers have noted 150 appearances of the *aurora borealis* in the course of 200 days in the northern regions; but it appears that at the poles the nights without any aurora are altogether exceptions, so that we may infer their existence every night, though occasionally too faint to be clearly distinguished. Sometimes the same aurora has been seen at the same time at Moscow, Rome, and Cadiz.

Many hypotheses have been started as to the cause of this phenomenon. The invariable direction of their arches in relation to the magnetic meridian, and the perturbations which they produce in the mariner's compass, show that they must be attributed to electric currents which proceed from the poles towards the upper regions of the atmosphere; but the origin of this electricity is entirely unknown.

Fig. 489.



CLIMATOLOGY.

Mean Temperature.—The *mean temperature*, or simply the *temperature*, of a day, is that which is obtained by taking the sum of 24 observations made with the thermometer from hour to hour, and dividing this sum by 24. Experience shows that the mean temperature may be very nearly obtained by taking the mean between the maximum and minimum temperatures of the day and the night, which may be determined by means of the maxima and minima thermometer. The thermometer should be sheltered from the sun's rays, raised above the ground, and removed from every substance which might influence it by the radiation of heat.

The temperature of a month is the mean of that of thirty days, and the temperature of a year is the mean of that of twelve months. Lastly, the temperature of a place is the mean of its annual temperature for a great number of years. In all cases the temperature is that of the air, not that of the earth.

Causes which modify the Temperature of the Air.—The causes which affect the temperature of the air are principally, the latitude, the altitude, the direction of the wind, and the nearness of the sea.

1. *Influence of Latitude.*—The influence of the latitude results more or less from the obliquity of the solar rays; for the quantity of heat absorbed being greater in proportion as the rays approach more nearly to perpendicularity, the consequence is, that the heat absorbed from the sun decreases from the equator to the poles, since the rays are more and more oblique to the horizon. But this loss is partly compensated in summer, in the temperate and frigid zones, by the length of the days. At the equator, where the length of the day is invariable, the temperature is nearly invariable also; in our latitude, and in countries still further north, where the days are very unequal, the temperature varies very much, but in the summer it sometimes rises almost as high as at the equator.

Further, the lowering of the temperature, which results

from the latitude, is slow, it being necessary in such a climate as ours to go more than sixty miles northward to perceive a difference of one degree.

2. *Influence of Altitude.*—The altitude, that is, the height above the level of the sea, lowers the temperature much more rapidly than the latitude. In fact, in an ascent up Mount Blanc, Saussure observed a decrease of temperature of one degree for a height of about 260 feet; and Humboldt found a similar decrease for about 400 feet on Chimborazo. Taking the mean between these, we have a diminution of one degree for 330 feet, which is nearly 1,000 times that produced by the latitude.

The increasing coldness of the air as we ascend the higher regions of the atmosphere is experienced by those who go up in balloons, and is further proved by the perpetual snows which cover the summits of mountains. It is owing to the extreme rarefraction of the air, which necessarily diminishes its absorbing power. It also results from the distance of the earth, which cannot warm the air by contact, and the great power which gases possess of letting heat pass through them.

The law of the lowering of the temperature as we rise in the air is not known, on account of the many disturbing causes which tend to modify it, such as the wind, the degree of moisture, the hour of the day, etc. Experience teaches, that the difference in the temperature of two places at different elevations is not proportional to the difference of altitude, but for great heights the law is approximately true.

3. *Influence of the Direction of the Winds.*—As the winds necessarily participate in the temperature of the countries over which they pass, their direction at any given spot has great influence upon the temperature of the air there. The warmest wind is that from the south; then come the south-east, south-west, west, east, north-west, north, and lastly the north-east. Further, the character of the winds changes with the seasons; the east wind, for instance, which is cold in winter, is warm in summer.

4. *Influence of the nearness of the Sea.*—The nearness of the sea tends to raise the temperature of the air and render it more uniform. In fact, it is observed that in the tropics, and especially in the polar regions, the temperature of the sea is always more elevated than that of the atmosphere. With regard to the uniformity of the temperature of the sea, experience shows that in temperate regions, *i. e.* from twenty-five to fifty degrees latitude, the difference of temperature between the maximum and minimum of the day does not exceed four or five degrees at sea, while on land it reaches twenty-two or twenty-seven degrees. In islands the uniformity of the temperature is very perceptible, even during the greatest heat. On going into the interior of continents, winters at the same latitude are colder, and the difference between summers and winters is greater.

Isothermal Lines.—When we join together on a map all the places whose mean temperature is the same, we obtain curves to which Humboldt was the first to call attention, and which are called *isothermal lines*. If the temperature of a place varied only according to the obliquity of the sun's rays, *i. e.* with the latitude, the isothermal lines would be all parallel to the equator; but as the temperature varies according to several local circumstances, and especially the altitude, these lines are always more or less devious in their course. However, at sea they are nearly parallel. The space between two isothermal lines is called an *isothermal zone*.

Climates.—By *climates* are understood a certain number of isothermal zones, distinguished by their mean annual temperature. There are seven climates so distinguished:—1. A *burning climate*, from eighty to seventy-five degrees. 2. A *warm climate*, from seventy-five to sixty-eight degrees. 3. A *mild climate*, from sixty-eight to fifty-nine degrees. 4. A *temperate climate*, from fifty-nine to fifty degrees. 5. A *cold climate*, from fifty to forty-one degrees. 6. A *very cold climate*, from forty-one degrees to freezing point. 7. A *freezing climate*, below freezing point.

These climates are divided into *constant climates*, the temperature of which, in summer and winter, does not differ more than eleven or fifteen degrees; *variable climates*, the difference of whose temperature at the two extremes is twenty-nine to thirty-six degrees; and *excessive climates*, in which this difference is more than fifty-four degrees. The climates of London and Paris are variable; those of Pekin and New York excessive. The climates of islands are generally little varied, the temperature of the sea being pretty uniform, and hence the distinction between *marine* and *continental climates*. The characteristic of marine climates is, that the difference of temperature in summer and winter is always much less than in continental climates.

Distribution of Temperature on the Surface of the Globe.—The temperature of the air at the surface of the globe is subject to disturbing causes, so numerous and so purely local, that its distribution appears subject to no general law. All that can be done is to establish the mean temperature of each place by numerous observations. The highest observed temperature at the surface of the globe is that of Esne in Egypt, which was 116°, and the lowest that of Fort Reliance in North America, where it was 68° below zero, or 100° below freezing point; which gives a difference of 184° between the highest and lowest observed temperatures.

As navigators have never been able to reach the Poles on account of the ice, we do not know the temperature of those points. We only know that in each hemisphere the *glacial pole*—*i.e.* the coldest point, does not coincide with the terrestrial pole. In our hemisphere it is north of Behring's Straits, twenty degrees from the north pole. Many philosophers have attempted to ascertain the mean temperature of the north pole, and have arrived at various results, the discordance between which is in itself sufficient to deprive them of all claim to confidence. The temperature of the south pole is still more uncertain.

Temperature of Seas, Lakes, and Springs.—The temperature of the sea between the tropics is generally nearly the same as that of the air; in the polar regions the sea is always warmer than the atmosphere.

The temperature of the sea under the torrid zone is uniformly from 79° to 81° at the surface. It diminishes as the depth increases; and in temperate regions, as in tropical regions, the temperature of the sea at great depths is kept between thirty-six and thirty-eight degrees. The low temperature of the great depths is explained by the sub-marine currents which convey the cold water of the polar seas to the equator.

The temperature of lakes presents much greater variations than that of the sea. Their surface, which may freeze in winter, is heated in summer up to sixty-eight or seventy-seven degrees. The bottom, on the contrary, preserves nearly the same temperature of thirty-nine degrees, which is that of water at the maximum of density.

Springs, which arise from rain-water filtered into the crust of the earth at various depths, necessarily tend to the same temperature as the strata of earth through which they pass. Consequently, when they reach the surface of the soil, their temperature depends upon the depth to which they have attained. But if the spring is not abundant, its temperature is raised in summer and lowered in winter by that of the strata through which it passes. If the springs come from a very great depth, their temperature may far exceed the mean temperature of the place, and they then take the name of *thermal springs*.

In consequence of their high temperature, thermal springs acquire the property of dissolving several mineral substances which they meet in their course, and they are then called *mineral springs*. The substances which they hold in solution are most frequently carbonic, sulphurous, sulphydric, chlorhydric, and sulphuric acids; or sulphur, hyposulphites, sulphates, carbonates, chlorides, and iodides.

The temperature of thermal springs is not generally affected by the abundance of rain, or by drought; but it is affected by earthquakes, after which it has been found sometimes to rise and at other times to fall.

Distribution of Water over the Surface of the Globe.—The distribution of water over the surface of the globe exercises great influence upon climate. The waters of the globe are much more extensive than the land, and their distribution is very unequal in the two hemispheres. Indeed the extent of water is about three times as great as that of the land. In the southern hemisphere the surface of the seas is much greater than in the northern hemisphere, being in the ratio of thirteen to nine.

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The depth of the sea is very variable. Generally it does not exceed a thousand or thirteen hundred feet; but in the open sea it is often four thousand feet, and sometimes the line has not reached the bottom though it has been lowered to a depth of thirteen thousand feet.

BIOGRAPHY.—No. XXIX.

LYDIA HUNTLEY SIGOURNEY,

Was born in Norwich, Connecticut, in the year 1791. She was the only child of her parents, and consequently was brought up with great tenderness. Her parentage was in that happy mediocrity which requires industry, yet encourages hope; and the habits of order and diligence in which she was carefully trained by her judicious mother have no doubt been of inestimable advantage to the intellectual character of the daughter.

She early exhibited indications of genius. Perhaps the loneliness of her lot, without brother or sister to share in the usual sports of childhood, had an influence on her pursuits and pleasures. We are by no means in favour of establishing precocity of intellect as the standard of real genius. Still, it is true that many distinguished persons have been marked in childhood as extraordinary; the opening blossom has given forth the sweet odour which the rich fruit, like that of the Mangostan, embodies in its delicious perfection. At eight years of age the little Lydia was a scribbler of rhymes; like Pope, "lisping in numbers." Her first work was published in 1815. It was a small volume, entitled, "Miscellaneous Pieces in Prose and Verse." Before this, however, she had fortunately met with a judicious and most generous patron. To Daniel Wadsworth, Esq., of Hartford, belongs the tribute of praise which is due for drawing such a mind from the obscurity where it had remained "afar from the untasted sunbeam."

In 1819 Miss Huntley was united in marriage with Charles Sigourney, a respectable merchant of Hartford, Connecticut; a gentleman of cultivated taste and good literary attainments. From that period Mrs. Sigourney devoted her leisure to literary pursuits; she has produced a variety of works, each and all having one general design—that of doing good.

In 1822 she published "Traits of the Aborigines of America;" a descriptive and historical poem in five cantos. It depicts with truth, and often with much vigour, the condition of the red man before the arrival of his European conqueror, and has passages of deep tenderness and wild beauty. Yet, written as it is in blank verse, and rather discursively, the impression it leaves on the mind is not powerful.

Mrs. Sigourney's next work was in prose—"A Sketch of Connecticut Forty Years Since," published in 1824. During the ensuing fourteen years she sent forth "Poetry for Children," "Sketches; a Collection of Prose Tales, etc.," "Poems," "Zinzendorf," "Letters to Young Ladies," and "Letters to Mothers." All these were favourably received by the American public, and gave the author a warm place in the heart of the people.

In 1840 Mrs. Sigourney went to Europe, visiting England and Scotland in the summer, and passing the winter in Paris, where she received much kindness. She returned to her home in Hartford during the spring of 1841. While on her visit, a volume of her selected poems, superbly illustrated, was published in London, and soon after her return, "Pocahontas," the most carefully finished of her long poems, came out in New York. In 1842 her "Pleasant Memories in Pleasant Lands," a record in prose and verse of her wanderings abroad, was issued; and in 1846, "Myrtis, with other Etchings and Sketching," was published. Since then she has sent out several works, among which are "Water-drops;" an excellent contribution to the temperance cause. A volume of her "Poems," beautifully illustrated, was published in 1848.

The talents and industry of Mrs. Sigourney have won for her a good reputation; and though critics have attempted to disparage her genius by accusing her of imitating Mrs. Hemans, yet her works are esteemed by Christians as the most useful of their class. An American critic has well defined the powers of this truly American poetess;—"Mrs. Sigourney's works express with great purity and evident sincerity the tender affections which are so natural to the female heart, and the lofty aspirations after a higher and better state of being which constitute the truly ennobling and elevating principle in art as well as nature. Love and religion are the unvarying elements of her song; if her powers of expression were equal to the purity and elevation of her habits of thought and feeling, she would be a female Milton or a Christian Pindar. But though she does not inherit

'The force and ample pinion that the Theban eagles bear,
Sailing with supreme dominion through the liquid vaults of air,

she nevertheless manages language with ease and elegance, and often with much of the *curæ felicitas*, that 'refined felicity' of expression, which is, after all, the principal charm in poetry. In blank verse she is very successful; the poems that she has written in this measure have not unfrequently much of the manner of Wordsworth, and may be nearly or quite as highly relished by his admirers."

The predominance of hope with devotional feeling has inclined Mrs. Sigourney to elegiac poetry, in which she excels. Her muse has been a comforter to the mourner. No poet has written such a number of these songs, nor are these of necessity melancholy. Many of hers sound the notes of holy triumph and awaken the brightest anticipations of felicity—ay,

"Teach us of the melody of heaven."

She "leaves not the trophy of death at the tomb," but shews us the "Resurrection and the Life." Thus she elevates the hopes of the Christian and chastens the thoughts of the worldly-minded. This is her mission, the true purpose of her heaven-endowed mind; for the inspirations of genius are from heaven, and, when not perverted by a corrupt will, rise upward as naturally as the morning dew on the flower is exhaled to the skies.

We must not omit to record that Mrs. Sigourney is, in private life, an example to her sex, as well as their admiration in her literary career. She is a good wife and devoted mother; and in all domestic knowledge and the scrupulous performance of her household duties, she shows as ready acquaintance and as much skill as though these alone formed her pursuits. Her literary studies are her recreations—surely as rational a mode of occupying the leisure of a lady as the morning call or the evening party.

As a specimen of the lively and practical style in which Mrs. Sigourney treats what may be termed "Home" subjects, the following is subjoined:—

THE THRIVING FAMILY.

A SONG.

Our father lives in Washington,
And has a world of cares,
But gives his children each a farm,
Enough for them and theirs.
Full thirty well-grown sons has he,
A numerous race indeed,
Married and settled all, d'ye see,
With boys and girls to feed.
So, if we wisely till our lands,
We're sure to earn a living,
And have a penny too to spare
For spending or for giving.
A thriving family are we,
No lordling need deride us;
For we know how to use our hands,
And in our wits we pride us.
Hail, brothers, hail!
Let nought on earth divide us.

Some of us dare the sharp north-east;
Some clover-fields are mowing;
And others tend the cotton-plants
That keep the looms a-going;
Some build and steer the white-wing'd ships,
And few in speed can mate them;
While others rear the corn and wheat,
Or grind the corn to freight them.

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And if our neighbours o'er the sea
Have e'er an empty larder,
To send a loaf their babes to cheer
We'll work a little harder.
No old nobility have we,
No tyrant king to ride us;
Our sages in the capitol
Enact the laws that guide us.
Hail, brothers, hail!
Let nought on earth divide us.

Some faults we have, we can't deny,
A foible here and there;
But other households have the same,
And so we won't despair.
'T will do no good to fume and frown,
And call hard names, you see,
And what a shame 'twould be to part
So fine a family!
'Tis but a waste of time to fret,
Since Nature made us one,
For every quarrel ont a thread
That healthful Love has spun.
Then draw the cords of union fast,
Whatever may betide us,
And closer cling through every blast,
For many a storm has tried us.
Hail, brothers, hail!
Let nought on earth divide us.

THEORY AND PRACTICE OF TEACHING.

No. VIII.

REQUISITES IN THE TEACHER FOR GOOD GOVERNMENT.

I. Self-Government. It has frequently been said that no man can govern others till he has learned to govern himself. We have no douht of the truth of this. If an individual is not perfectly self-possessed, his decisions must fail to command respect. The self-government of the teacher should be complete in the following particulars:

1. *As to the passion of anger.* The exhibition of anger always detracts from the weight of authority. A man under its influence is not capable of doing strict justice to his pupils. Before entering upon teaching, therefore, a man should somehow obtain the mastery over his temper, so that under any provocation he can control it. He should consider that in school his patience will often be severely tried. He should not expect, indeed, that the current of affairs in school will for a single day run perfectly smooth. He should, therefore, prepare for the worst, and firmly resolve that, whatever unpleasant thing shall occur, it shall not take him entirely hy surprise. Sueh forethought will give him self-command. If, however, from his past experience and from the nature of his temperament, he is satisfied he cannot exercise this self-control, he may be assured he is the wrong man to engage in teaching. A man who has not acquired thorough ascendency over his own passions, is an unsafe man to he intrusted with the government of children.

2. *As to levity and moroseness of manner.* Either extreme is to be avoided. There are some teachers who exhibit such a *frivolity* in all their intercourse with their pupils, that they can never command them with authority, or gain their cordial respect. This is a grievous fault; and the teacher should at once find an antidote for it, hy serions reflection npon the responsibility of his position. If this will not cure it, nothing else can.

There are others who are characterised by a *perpetual peevishness*, so that a pleasant word from them is indeed a strange thing. They can never expect to gain the affections of their pupils; and without securing the *love* of children, the government of them will never be of the right kind. This habit of *snappishness* should be broken up at once.

There are some very young teachers who sometimes *assume* one or the other of these peculiar modes of address, or perhaps both, to he used alternately,—fancying that they will gain popularity by the one, or give themselves greater authority by the other. This is a very mistaken notion; for children have more discernment than most men give them credit for, and they usually see directly through such a flimsy disguise,—and the teacher becomes ridiculous rather than great in their estimation, whenever he takes any such false position.

Mr. Abbot, in his "Teacher," states a fact which well illustrates this point. "Many years ago," says he, "when I was a child, the teacher of the school where my early studies were performed closed his connection with the establishment, and, after a short vacation, another was expected. On the appointed day the boys began to collect, some from curiosity, at an early hour, and many speculations were started as to the character of the new instructor. We were standing near a table with our hats on,—and our position, and the exact appearance of the group, is indelibly fixed on memory,—when a small and youthful-looking man entered the room and walked up towards us. Supposing him to be some stranger, or rather, not making any supposition at all, we stood looking at him as he approached, and were thunder-struck at hearing him accost us with a stern voice, and sterner brow:—'Take off your hats! Take off your hats, and go to your seats.' The conviction immediately rushed upon our minds that this must be the new teacher. The first emotion was that of surprise, and the second was that of the ludicrous; though I believe we contrived to smother the laugh until we got out in the open air."

The true rule is to act the part which is agreeable to nature. The teacher having gained the self-command just insisted upon, and having in him the spirit of kindness and a desire to be useful, should assume nothing unnatural for effect. His manner should be truly dignified, but courteous.

3. *As to his treatment of those pupils that are marked by some peculiarity.* There will usually be some pupils who are very backward, and perhaps very dull,—or who may have some physical defect, or some mental eccentricity. The teacher should be able to govern himself in all his remarks concerning such pupils. He should avoid all allusions to such singularities before the school; and it is the height of injustice—we were about to say, of malevolence—for him ever to use those low and degrading epithets so often found upon the teacher's tongue,—such as dunce, thickskull, and the like. Is it not misfortune enough for a child to be backward or dull, without having the pain and mortification increased hy the cruelty of an unfeeling teacher? The teacher should take a special interest in such children; he should endeavour to enter into the feelings of their parents, and to treat them in such a way as to encourage rather than crush them.

II. A confidence in his ability to govern. We can generally do what we firmly believe we can do. At any rate, a man is more likely to succeed in any enterprise when he has the feeling of self-reliance. The teacher, by reflection upon the importance of good government to his success, and by a careful study of the means to be employed and the motives to be presented, should be able to bring himself to the determination to have good order in his school, and so fully to believe he *can* have it, that his pupils shall detect no misgivings in him on this point. Whenever they discover that he has doubts of his success in governing, they will be far more ready to put his skill to the test. It would be better that a young teacher should decline to take a difficult school, rather than enter it without the full belief of his ability to succeed. We would not wish to be understood by these remarks to be encouraging an unreasonable and *blind presumption*. A confidence in one's ability should be founded upon a reasonable estimate of his powers, compared with the difficulties to be overcome. What we recommend is, that the teacher should carefully weigh the difficulties, and candidly judge of his own resources, and then undertake nothing which he thinks is beyond his ability. If, after this, he *believes* he can succeed, other things being equal, success is almost certain.

III. Just views of government. 1. It is not *tyranny*, exercised to please the one who governs, or to promote his own convenience. The despot commands for the sake of being obeyed. But government, in its proper sense, is an arrangement for the *general good*,—for the benefit of the *governed* as well as of the ruler. That is not good government which seeks any other object. The teacher should so view the matter; and in establishing any regulations in school, he should always

inquire whether they are suggested by a selfish regard to his own ease, or whether they spring from a sincere and disinterested wish to promote the improvement of the school.

2. He should see the necessity of making the government *uniform*; that is, the same from day to day. If he punishes to-day what he tolerates to-morrow, he cannot expect the cordial respect of his pupils. Some teachers, not having learned the art of self-government, take counsel too much of their own *feelings*. To-day they are in good health and spirits, and their faces are clothed in *sunshine*; they can smile at anything. To-morrow, suffering under bad digestion, or the want of exercise, or the want of sleep, the thunder-storm hovers about their brow, ready to burst upon the first offender. Woe to the luckless wight who does not seasonably discover this change in the condition of the weather. A teacher cannot long *respect himself* who is thus capricious; he may be sure his school will not long respect him.

3. He should so view government as to *make it equal*; that is, equal in its application to the whole school,—the large as well as small scholars, the males as well as females. This is often a great fault with teachers. They raise up a sort of *aristocracy* in their schools, a privileged class, a miniature nobility. They will insist that the little boys and girls shall abstain from certain practices,—whispering, for instance—and most probably punish the offenders, while they tolerate the same thing among the larger pupils. This is cowardly in itself, and as impolitic as it is cowardly. The teacher makes a great mistake who begins his government with the small children, in the hope of frightening the larger ones into obedience. He should have the manliness and the justice to begin with the larger pupils; the smaller ones never resist, when authority is established with those above them. Besides this, the very class who are thus indulged are the very ones who soonest despise, and justly too, the authority of the teacher.

He should make his government *impartial* in every respect. He should have no favourites—no *preferences*, based upon the outward circumstances of the child, his family, or his personal attractions and the like. The rich and the poor should be alike to the teacher. He should remember that each child has a soul; and it is with the soul, and not with the wealth of this world, that he has to do. He should remember that a gem, as bright as a sunbeam, is often concealed under a rough exterior. It should be his work, nay his delight—to bring out this gem from its hiding-place, and apply to it the polish of a " workman that needeth not to be ashamed."

IV. Just views of the governed. Notwithstanding the imperfection of human nature, as developed in the young, they have some redeeming qualities. They are intelligent and reasonable beings. They have more or less love of approbation; they have affection, and above all, they have a moral sense.

All these qualities are considerably developed before they enter the school. The teacher should remember this, and prepare himself to address, as far as may be, all these. *Love of approbation*, as we have before seen, is not an unworthy motive to be addressed, and it is well known that many children are very easily controlled by it. It is not the highest motive, to be sure, nor is it the lowest. The *affection* for a teacher, which many children will exercise, is one of the most powerful instrumentalities in governing them with ease. The *conscience*, early trained, is all-powerful. We allude to these principles of action once more, in order to say that the peculiar character of each should be well studied by the teacher. He should understand the human mind so well as to be able to find the avenues to these better parts of the child's nature, remembering that whenever several ways are presented of doing the same thing, it is always wise to choose the best.

V. Decision and Firmness. By *decision*, we mean a readiness to determine and to act in any event just as duty seems to dictate; a willingness to take the responsibility just as soon as the way is plain. By *firmness*, is meant that *fixedness of purpose* which resolutely carries out a righteous decision. Both of these qualities are essential to good government in the teacher. Much time is often lost by a teacher's vacillating when action is more important. Besides, if the pupils discover that the teacher hesitates and dreads to take any responsibility, they very soon lose their respect for him. We would not urge that a teacher should act *hastily*. He never should decide till he is confident he decides right; any delay is better than hasty error. But his delay, in all matters of government, should have reference to a true knowledge of his *duty*; when that is clearly known, he should be decided.

Many teachers suffer in their government for want of firmness. They act upon the principle of personal convenience, as did the unjust judge mentioned in the parable. "And he would not for a while; but afterwards he said within himself, Though I fear not God nor regard man; *yet because this widow troubleth me*, I will arise and avenge her, *lest by her continual coming she weary me*." How often we hear something like this in the school-room. "May I go and drink?" says James, in a peculiarly imploring tone. "No," says the teacher, promptly, and evidently without any reflection as to the decision he has made. James very composedly sits down, eyeing the countenance of the teacher expressively, as much as to say, "I'll try you again soon." Before long he observes the teacher quite busy with a class, and he again pops the question: "May I go and drink?" Stung at the moment with impatience at the interruption, the teacher answers instantly and emphatically, "No, no, James, sit down." James still watches his teacher's expression, and cannot discover there any signs of a mind seeking the path of duty, and he silently thinks to himself, "the third time never fails." So, after a minute or two, when the teacher is somewhat puzzled with a knotty question, and is on the *point* of nibbing a pen besides,—"*May I go and drink, sir?*" again rings upon the teacher's ear. "*Yes, yes, yes!* do go along; *I suppose you'll keep asking till you get it.*"

Now James goes to drink, and then returns to philosophize upon this matter, perhaps as follows:—"I don't believe he stopped to think whether I needed drink or not; therefore hereafter I shall never believe he really means *no*, when he says it. He acts without thought. I have also found that if I will but ask several times, I shall get it. So I shall know how to proceed next time."—I do not know that any child would express this thought in so many words; but the impression upon his mind is none the less distinct.

Now the teacher should carefully consider the question addressed to him. How long since this child had water? Can it be necessary for him to drink so often? Then let the answer be given mildly, but decidedly—"No, James." The very manner, quite likely, will settle the question, so that James will not ask again. The answer once given should be *firmly* adhered to. It would even be better that James should suffer for the want of water than for the want of confidence in his teacher's firmness. In this way the teacher would establish his word with the school in a very few days; and his pupils would very soon learn that with him "no means no," and "yes means yes"—a matter of no small importance to the teacher of a school.

VI. Deep Moral Principle. The teacher should ever be a conscientious man; and in nothing is this more necessary than in the exercise of good government. In this matter the teacher can never respect himself when he acts from caprice or selfishness. His inquiry should be, What is right? What is justice—justice to my pupils—to myself? And if he could add to moral obligation the high sanctions of religious principle, and could habitually and sincerely turn his thoughts to his Maker, with the heartfelt inquiry—What wilt THOU have me to do?—then he would seldom err in the discharge of this trust. His pupils, seeing that he acted from fixed and deep principle, would respect his honesty, even if he should cross their desires.

LESSONS IN ITALIAN GRAMMAR.—No. LIII.

Syntax.—*Continued.*

OF PARTICIPLES.

Rule 70.—The Past Participle, used without an auxiliary, must agree in gender and number with the substantive to which it refers.

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Examples.

Venne intanto l' ora fissata della partenza, meanwhile the hour appointed for the departure arrived
Il padrone tornato a casa, andossene a letto, the master having returned home, went to bed
Servitù offerta non è mai stimata, offered slavery is never esteemed
Egli ha la mano tagliata, he has his hand cut off
Vi furono molte teste tagliate, there were many heads cut off

Rule 71.—The past participle, being used with the verb *essere*, to be, must agree with its subject in gender and number.

Examples.

Tuo nonno è morto, your grandfather is dead
Mio genero è partito, my son-in-law is gone
Le mie zie sono generose, my aunts are generous
Le foglie son cadute, the leaves have falleo
Bacco era coronato di pampini, Bacchus was crowned with vine leaves

Rule 72.—The past participle, used with any tense of the verb *avere*, to have, is indeclinable.

Examples.

La regina ha cenato col re, the queen has supped with the king
Ella ha dormito bene, she has slept long
Ha preso la cosa sul serio, he has taken the thing seriously
I gran principi hanno sempre protetto le persone sapienti, the great princes have always protected learned men
I lupi han divorato la sua greggia, the wolves have devoured his flock
Le mie sorelle non hanno ancora desinato, my sisters have not dined yet

Rule 73.—The past participle used with *avere*, and preceded by the pronouns *che, cui, il, quale, mi, ti, lo, la, ci, vi, li, gli, le, quali, quanti*, is to agree with them in gender and number.

Examples.

La casa che ho comprata, the house which I have bought
Voi vi dovete chiamar contenta della giustizia, che avete ottenuta da' vostri giudici, you must be satisfied with the justice which your judges have rendered to you
Le lettere che io aveva ricevute, the letters which I had received
Elle son più belle che gli angeli dipinti, che voi mi avete più volte mostrati, they are handsomer than the painted angels which you have oftentimes shown me
Gli ho veduti a spasso, I have seen them walking

OF ADVERBS.

Rule 74.—The Italian adverbs are generally placed after the verb in its simple tenses, or between the auxiliary and the past participle in its compound tenses.

Examples.

Ella m' amerà sempre, she will always love me
Camminate piano, walk gently
Non voglio assolutamente che voi sortiate oggi, I will not absolutely suffer you to go out to-day
E' già partito, he has already gone
Ha quasi finito, he has almost done

There are many exceptions; for the Italians place sometimes the adverbs in the beginning, in the middle, or at the end of a sentence.

Examples.

Ben sai, che io verrò, you know very well that I shall come
Il quale prestamente s'avventava alla gola di costei, which hastily seized her by the throat
Il quale aperse la porta prestamente, who quickly opened the door
Io te l' ho detto cento volte, I told it to you a hundred times

OF PREPOSITIONS.

Rule 75.—In Italian, prepositions are commonly placed before the words which they govern.

Examples.

Venite a Cambridge, come to Cambridge
Fatelo per me, do it for me
Passate da me, call upon me
Vicino al fonte, near the fountain
Rimpetto all' America, opposite America

Da.

Rule 76.—The preposition *da* is used when we wish to express an idea of separation, dependence, difference, origin, cause, use, fitness, distinction, residence, etc.

Examples.

Andate da quella parte, go this way
Allontanarsi da Roma, to depart from Rome
Astenersi dal parlare, to abstain from speaking
Da che egli è partito, since he is gone
Dall' anno scorso, from the last year
Difendersi dagli ipocriti, to defend one's self against hypocrites
Distinguere un cane da un lupo, to distinguish a dog from a wolf
Essere incalzato dal nemico, to be pursued by the enemy.
Fare una cosa da se, to do one thing of one's self
Guardarsi da uno, to beware of some one
Ripararsi dal vento, to shelter one's self from the wind
Slacciare una cosa da un' altra, to separate a thing from another
Vengono da due parti opposte, they come from two opposite quarters
Carta da scrivere, writing paper
Casa da vendere, house to be sold
Cavalli da carrozza, carriage-horse
Ragazza da maritare, girl to be married
Cozzare col più forte è da balordo, it is of a fool to contend with the strongest
E' uno storia da ridere, it is a story to make one laugh
E' un soggetto da commedia, it is a subject fit for a play
E' un ragazza da marito, she is a girl of a marriageable age
Io non ho armi da difendermi, I have no arms to defend myself
L' uomo dal mantello, the man of the cloak
Non sono cose da dirsi, these are not things to say
Non è cosa da un pari vostro, it is not a thing becoming to a man like you
Sono tempi da piangere, these are times to weep
Uomo da stento, a man to bear fatigue
Andate dal fornajo, go to the baker's
Andrò da mia madre, I will go to my mother's
Vive da signore, he lives like a lord
Ha trattato da birbante, he has acted like a rascal
Avete da fare? have you something to do?
Datemi da lavorare, give me some work to do
Dite da burla? do you speak in joke?
Dite da vero? do you speak in earnest?
Egli fa da dottore, he sets up for a doctor
Egli ha da due milioni di capitale, he has about two millions of capital
Il re era da un canto, la regina da un altro, the king was on one side, and the queen on the other
Non c' è da ridere, there is no reason for laughing
Uomo da bene, a good man
Visse da cento anni, he lived nearly one hundred years
Vi giuro, da galantuomo, I swear to you on the faith of an honest man
Venite qui da me, come here near me

A.

Rule 77.—The preposition *a* or *ad*, to, expresses intention, tendency, end, attribution, and the proximity of a place or person.

Examples.

Andare a pranzare, to go to dine
Appoggiarsi ad uno, to lean upon some one
Avvicinarsi ad uno, to come near some one
Egli venne a trovarmi, he came to meet me
Mandare a vedere, to send and see
Mi si avventò a dosso, he rushed upon me
Passare all' altra parte della strada, to cross on the other side of the street
Vicino al fuoco, near the fire

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Con.

Rule 78.—The preposition *con*, with, expresses the idea of society or union.

Examples.

Stringere amicizia con alcuno, to begin a friendship with some one
E' uscita col servitore, he is gone with his servant
Egli camminava col bastone in mano, he walked with the cane in his hand
Venite insieme con me, come along with me
Parlai con suo fratello, I spoke with her brother

In.

Rule 79.—The preposition *in*, in or upon, on, expresses the existence of an object in or on a body.

Examples.

Sto in casa, I stay in the house
Morire in età di cento anni, to die at the age of one hundred years
Mettere una cosa in tasca, to put a thing in one's pocket
Il pranzo è in tavola, the dinner is on the table
Essere in mare, to be at sea

OF CONJUNCTIONS.

Rule 80.—The following conjunctions, and all those that are attended by a preposition, require the verb which follows them to be put in the infinitive.

A fine di, in order to
Avanti di, before
Dopo, after
In vece di, instead of
Per, to
Per paura di, for fear
Prima di, before
Senza, without

Examples.

A fine di perfezionarla, in order to perfect yourself
Dopo aver detto, after having said
Per dir il vero, to tell the truth
Prima di partire, before going
Senza dal nostro proposito deviare, without devisting from our subject

Rule 81.—The following conjunctions require the verb which follows them to be put in the indicative.

Attesochè, since
A causa che, because
Di maniera che, so that
Eccetto che, unless
In tanto che, so that
Mentre che, whilst
Oltre che, besides that
Secondo che, according as
Se non che, except
Subito che, as soon as, etc.

Examples.

Bisogna compatirlo attesochè il poverino è matto in mezzo al cervello, we must excuse him, since the poor fellow is a crack-brain
Di maniera che ella può far ciò che la piace, so that you may do what you please
In tanto che non ritorno più, so that he returned no more
Non ho cosa alcuna da dirvi se non che conviene i vostri maestri ubbidire, I have nothing to say to you, except that you must obey your masters
Subito che il sole fu levato, as soon as the sun was risen

Rule 82.—The following conjunctions require the verb which follows them to be put in the subjunctive.

Acciocchè, that
Affinchè, in order that
Ancorchè, though
Anzi che, before that
Avanti che, before that
Avvegnachè, though
Benchè, although
Caso che, in case that
Come se, as if
Con patto che, on condition that
Come che, although
Dato che, suppose that
Innanzi che, before that
Purchè, provided that
Quando anche, although
Quasi, as if
Quantunque, though
Poniamo che, suppose that
Prima che, before that
Senza che, without that
Contuttochè, although

Examples.

Lo dice acciocchè, non diate a me la colpa, he said it that you may not lay the fault upon me
Affinchè ella gli scriva, in order that you may write to him
Benchè sia difficile, bisogna però vincere se stesso, however difficult it may be, we must nevertheless conquer ourselves
Ancorchè sia in età molto avanzata, nulladimeno gode perfetta salute, he enjoys perfect health, though in very advanced age
Verrà, purchè non piova, I will come, provided it does not rain

Rule 83.—The following conjunctions sometimes govern the indicative, and sometimes the subjunctive.

Fino che, finchè, finattantochè, infino che, infinchè, infinattantochè, till or until
Perchè, why
Quando, when
Se, if
Sebbene, though
Se bene, although
Che, that
Conciossiachè, conciossiacosachè, for

Examples.

Lo mio cuore non può essere in pace, finattantochè, egli non si riposi in voi, my heart cannot rest, till it finds its repose in you
Che alcun non v' entrasse dentro, infinattantochè egli tornato fosse, that nobody should enter until his return
Niuna doversi muovere del luogo suo, finattantochè io non ho la mia novella finita, none of you are to stir from your places, till I put an end to my story
Super le rugiadose erbe, infinattantochè alquanto il sole fu alzato, colla sua compagnia diportando se n' andò, she and all the company walked leisurely upon the dewy grass until the sun was a little higher
Chi le la fa, fagliele, e se tu non puoi, tienlati a mente finchè tu possa, to him who plays you a trick, play another, and if you cannot, bear it in mind until you can

LESSONS IN SPANISH.—No. XXIII.

OF THE PREPOSITION.

The prepositions are employed in such a variety of ways in Spanish and in English, that each one is not always to be rendered from one language to the other by the same word. Thus *de* is not always to be translated into English by of; nor of into Spanish always by *de*. The following observations will serve to show the manner in which the prepositions are to be used.

"About," when it means through, is rendered by *por*; when it means on, by *sobre*; when it means within, by *en*; when it means of, by *de*; as,

She went singing about the village, *ella iba cantando por el lugar.*
Locke wrote about Christianity, *Locke escribió sobre el Christianismo.*
They are about the palace, *ellos estan en el palacio.*
He does not talk about politics in public, *no habla de politica en publico.*

"Above" is rendered by *sobre*; as,

The bird flies above the earth, *el ave vuela sobre la tierra.*

"Against," meaning in opposition to, or contrary to, is rendered by *contra*; as,

They fought against the Mexicans, *ellos pelearon contra los Mejicanos.*
Against the law, *contra la ley.*

"After," meaning later in time, is rendered by *despues de*; when it means according to, by *á*, or *segun*; and when it means immediately behind, by *tras*; as,

After six o'clock, *despues de las seis.*
After the French fashion, *á la moda francesa.*
After this manner, *segun este modo.*
He throws the rope after the bucket, *echa la soga tras el caldero.*

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"According" to is rendered by *segun*, and sometimes by *para con*; as,

According to the orders of your-worship, *segun las órdenes de vmd.*

According to him it-is-worth nothing, *para con él no vale nada.*

"Among," when it means, of the number of, is rendered by *entre* or *para entre*; when it means, in the midst of, by *en médio de*; and when it means in, by *en*; as,

Among the men there-is not one that is upright, *entre los hombres no hay uno, que sea recto.*

Among friends compliments are unnecessary, *para entre amigos los cumplimientos son escusados.*

I send you as lambs among wolves, *yo os envio como corderos en médio de lobos.*

Among many nations there-was not a king like him, *en muchas naciones no habia rey semejante á él.*

"At," when it denotes in or on, is rendered by *en*; when it denotes proximity, precedes the price of anything or the time of day, or means, in readiness for, it is rendered by *á*; as,

They are at home, *ellos están en casa.*

They are at peace, *ellos están en paz.*

John is at Rome, *Juan está en Roma.*

They are at sea, *ellos están en la mar.*

At the bridge, *al puente.*

At hand, *á la mano.*

At six dollars a bushel, *á seis pesos la fanega.*

At four o'clock, *á las cuatro.*

He-is at my command, *está á mi mando.*

At work, *al trabajo.*

"Before," meaning, in the presence of, is rendered by *ante*; meaning, in front of, or the opposite of behind, by *delante de*; meaning precedent in rank, or previous in time (that is, the opposite of after), by *ántes de*; as,

The cause will-be brought before the judges, *la causa se llevará ante los jueces.*

He-went before them to point-out the way, *iba delante de ellos para mostrar el camino.*

Prostrated on the earth before the ark of-the Lord, *prostrado en tierra delante del arca del Señor.*

The Dukes take-rank before the Marquises, *ántes de los Marqueses son los Duques.*

Before night-fall, *ántes de anochecer.*

Before day, *ántes del dia.*

"Behind" is rendered by *tras*, or *detras de*; as,

Behind the door, *tras la puerta.*

Behind them, *detras de ellos.*

"Below" is rendered by *debajo de*; as,

Below the lip, *debajo del lábio.*

"Between" is rendered by *entre*; as,

To-discern between the good and the evil, *discernir entre lo bueno y lo malo.*

"By," meaning at or in, is rendered by *de*; meaning future time, when, by *para*; meaning close to or alongside of, by *junto á*; and meaning through, by *por*; as,

By day, *de dia.*

By night, *de noche.*

I shall-need it all by Saturday, *yo lo necesitaré todo para el sábado.*

Please to seat yourself by the window, *sírvase vmd. sentarse junto á la ventana.*

He-has made himself rich by wicked means, *se ha hecho rico por malos médios.*

"Concerning," meaning about or in regard to, is rendered by *acerca de* or *tocante á*; as,

Concerning that which we-have spoken, *acerca de lo que hemos hablado.*

Concerning (or touching) this affair, *tocante á esta pendéncia.*

"For," meaning during; on account of, for the sake of, or, in behalf of; in exchange for; for the purpose of getting; as; by (per); is rendered by *por*; and when it means, for the use of, or, with the intention of going to, it is rendered by *para*, as,

Can you give me a room for this night? *¿puede vmd. darme un cuarto por esta noche?*

They-think that for much speaking they-will be heard, *piensan que por mucho hablar serán oidos.*

They-died for their country, *murieron por su pátria.*

I will give him my flute for his violin, *le daré mi flauta por su violin.*

To-go for money, *ir por dinero.*

She received him for a husband, *ella le recibió por esposo.*

For a beginner he has done it well, *para un principiante lo ha hecho bien.*

How much for a day? *¿cuánto por dia?*

I-have-bought it for my wife, *lo he comprado para mi muger.*

He set out for Spain, *salió para España.*

"For" is sometimes used in English when it would not be in Spanish; thus, I want to alight for a moment, *necesito bajar un momento.* *For* is sometimes used in Spanish when it would be redundant in English; as, *uno vale por muchos*, one is-worth many.

"From," when it means since, or from the time of, and of distance from, is generally rendered by *desde*; in other cases, by *de*; as,

From childhood thou-hast-known the Holy Scriptures, *desde la niñez aprendiste las sagradas letras.*

It-is fifty miles from Vera Cruz to Jalapa, *hay cincuenta millas desde Vera-Cruz á Jalapa.*

When did you return from the country? *¿cuando ha vuelto vmd. del campo?*

"In," meaning, in the time of, within, and into, is rendered by *en*; when it means, through the course of or during, by *por*; and when, after superlatives or other adjectives, it means of, by *de*; as,

In the winter, *en el invierno.*

In Spain, *en España.*

In the morning, *por la mañana.*

This ward is one of the best in the city, *este bárrio es de los mejores de la ciudad.*

Austere in disposition, *acre de génio.*

"Instead of," is rendered by *por*; and by *en lugar de*, when it means, in the place of; as,

He-came instead of his father, *vino él por su padre.*

Archelaus was-reigning in Judea instead of Herod his father, *Arquelde reinaba en Judéa en lugar de Herodes su padre.*

"Into," when it comes after the verb enter, and when it means inside of, is rendered by *en*; but after all verbs of motion (to enter, excepted) it is rendered by *á*; as,

Let-us-enter into this grove, *entremos en este bosque.*

Pour oil into the lamp, *eche vmd. aceite en la lámpara.*

Let-us-go into the dining-room, *vamos al comedor.*

"Of" is rendered by *de*; as,

A friend of the king, *un amigo del rey.*

"On" or upon, meaning along, is rendered by *en*; meaning through, by *por*; meaning by, it is rendered by *de*; and meaning in contact with the upper surface of anything, by *sobre*; as,

Is-there danger on (or upon) the road? *¿hay peligro en el camino?*

Man lives not on bread alone, *el hombre no vive de solo pan.*

Nothing ought to be affirmed upon mere probability, *nada debe afirmarse por una mera probabilidad.*

It is on (or upon) the chair, *está sobre la silla.*

Sometimes "on" is rendered by *á*; as, *á caballo*, on horseback; *á pié*, on foot; *á bordo*, on board. Upon, after the verbs, to count, rely, etc., is rendered by *con*; as, *cuento con la amistad de Diego*, I rely upon the friendship of James.

When "on" in English is used before the days of the week or month, it is not rendered in Spanish; thus, *ella llegó allí el sábado*, she arrived there on Saturday.

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"Out of," meaning, removed from, beyond and outside of, is rendered by *fuera de;* meaning on account of, by *por;* meaning from, by *de;* as,

Out of danger, *fuera de peligro.*
Out of my power, *fuera de mis alcances.*
I have beans that are out of the ground, *tengo habas que están fuera de tierra.*
Out of friendship, *por amistad.*
He-drinks out of a tumbler, *bebe de un vaso.*

"Over" is rendered by *encima de* when it means above; and otherwise by *sobre;* as,

Over the window, *encima de la ventana.*
He-wept over the city, *lloró sobre la ciudad.*

"Through," meaning from one end or side to another, or on account of, is rendered by *por;* when it means by reason of, by *de;* as,

He-travelled through Spain, *viajó por España.*
Through the fear of death they were in bondage all their life, *por el temor de la muerte estaban en servidumbre toda la vida.*
She trembles through fear, *ella tiembla de temor.*

"Till" is rendered by *hasta;* as,

The office is open till ten o'clock at night, *la oficina está abierta hasta las diez de la noche.*

"To," when preceded by from, in such phrases as, from bad to worse, from time to time, is rendered by *en;* when it means of, by *de;* and in other cases generally by *á;* as,

From day to day, *de dia en dia.*
A friend to his country, *un amigo de su patria.*
An uncle to John, *un tio de Juan.*
He-gave the inkstand to Mary, *dió el tintero á María.*

"Towards" is rendered by *hácia;* as,

Here comes towards us the lady of the house, *aquí viene hácia nosotros la señora de la casa.*

"Under" is rendered by *debajo de* or *bajo;* as,

Under the bridge, *debajo del puente.*
Under the table, *bajo la mesa.*

"Under" is rendered by *so* in the following phrases, *so capa de,* under cover of; *so color de,* under colour of; *so pena de,* under penalty of; *so pretexto de,* under pretext of.

"With," when meaning of, or from, or by, is rendered by *de;* in most other cases by *con;* as,

We are covered with dust, *estamos cubiertos de polvo.*
We are dying with cold, *nos morimos de frio.*
John killed him with a sabre-stroke, *Juan le mató de un sablazo.*
With permission of the captain, *con permiso del capitan.*

"Within" is rendered by *dentro de;* as

I shall need it within three days, *lo necesitaré dentro de tres dias.*

"Without," meaning destitute of, with exemption from, is rendered by *sin;* and when it means outside of, or beyond, by *fuera de;* as,

Treat me without ceremony, *trátame vmd. sin ceremónia.*
To buy without money, *comprar sin dinero.*
They cast him without the city, *le echaron fuera de la ciudad.*

Sin in Spanish is regarded as a negative preposition, and is therefore often followed by a negative conjunction; as,

Sin otro fin ni motivo, without another end or (nor) motive.

There are other prepositions in Spanish, which, as they can be rendered in most cases by the corresponding English preposition, offer no difficulty to the learner. Such are *para con,* in respect to; *ademas de,* besides; *á pesar de,* in spite of, notwithstanding; *cerca de,* near to; *frente á,* or *en frente de,* opposite; *en orden á,* with regard to; *junto á,* adjoining; *por el médio de,* across; *durante,* during.

The preposition *entre,* between, when it comes before personal pronouns, does not govern them in the objective case in Spanish, but is followed by them in the nominative; as, *entre tú y yo* (and not *entre tí y mí*), between thee and me.

Prepositions, as in English, are placed before the word which they govern.

Care must be taken to distinguish the use of the same word in English, whether employed as a preposition or an adverb or conjunction. Thus in the phrases, after breakfast, before dinner, the words after and before are prepositions, and are to be rendered by *despues de* and *ántes de,* respectively; while in the phrases, after I had departed, before I had dined, the words after and before are adverbs, and are to be rendered by *despues que* and *ántes que.*

Segun, when used before a verb in Spanish, is not a preposition, but an adverb, meaning, according as; as, *segun creo,* according as I believe; *segun pareció,* according as it appeared.

OF THE INTERJECTION.

The position of the interjection in a sentence is determined by no fixed rules, but is allowed to vary, as in English, according as harmony and propriety may require.

The interjection *ete,* lo, behold, is used with the first objective case of the personal pronouns only, being joined to them and forming one word; as,

¡Eteme! behold me!
¡Etele! behold him!
¡Etela! behold her!
¡Etelos que vienen! lo they come!

The interjection *he,* see, behold, is prefixed to the first objective case of personal pronouns, and precedes adverbs, such as *aquí,* here, *allí,* there; as,

¡Hele aquí! here he is!
¡Hela aquí! here she is.
¡Helos allí! there they are!

More literally these exclamations might be rendered, "see him here!" "see her here!" "behold them there!"

When adjectives are employed as interjections, they are followed by the preposition de, if a noun or pronoun come after; as,

¡Desgraciado de mí! unlucky me! (or, unfortunate that I am!)

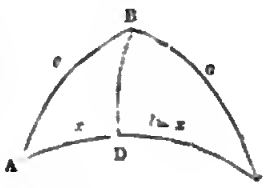
The interjection *ay* is followed by *de* when used before a noun or pronoun; as,

¡Ay de mí! alas for me! (or, woe to me!)

LESSONS IN TRIGONOMETRY.—No. VI.

TRIGONOMETRICAL FORMULÆ.

Let A B C be any spherical triangle, and from the angle B draw the arc B D perpendicular to the base A C. Represent the sides of the triangle by a, b, c, and the segment A D by x; then will C D be equal to $b - x$.



By Theorem III., Cor. 1,

$$\cos. c : \cos. a :: \cos. x : \cos. b - x$$
$$:: \cos. x : \frac{\cos. b \cos. x + \sin. b \sin. x}{R}$$

Whence,

$$R \cos. a \cos. x = \cos. b \cos. c \cos. x + \sin. b \cos. c \sin. x;$$

or, dividing each term by cos. x, we obtain,

$$R^2 \cos. a = R \cos. b \cos. c + \sin. b \cos. c \tan. x.$$

But, by Theorem II., Cor. 2, we have,

$$\tan. x = \frac{R \cos. A}{\cot. c} = \frac{\cos. A \sin. c}{\cos. c}.$$

Hence, $R^2 \cos. A = R \cos. b \cos. c + \sin. b \sin. c \cos. A$, (1) from which all the formulæ necessary for the solution of spherical triangles may be deduced.

From this equation we obtain, by transposition,

$$\cos. A = \frac{R^2 \cos. a - R \cos. b \cos. c}{\sin. b \sin. c},$$

a formula which furnishes an angle of a triangle when the three sides are known.

If we add R to each member of this equation, we shall have,

$$R + \cos. A = \frac{R^2 \cos. a + R \sin. b \sin. c - R \cos. b \cos. c}{\sin. b \sin. c}.$$

But,
$$R + \cos. A = \frac{2 \cos.^2 \frac{1}{2} A}{R},$$

And,

$$R \sin. b \sin. c - R \cos. b \cos. c = -R^2 \cos. (b + c).$$

Hence, by substitution, we obtain,

$$\frac{2 \cos.^2 \frac{1}{2} A}{R} = \frac{R^2 (\cos. a - \cos. (b + c)}{\sin. b \sin. c.}$$

$$= \frac{2 R \sin. \frac{1}{2}(a + b + c) \sin. \frac{1}{2}(b + c - a)}{\sin. b \sin. c}.$$

If, then, we put $s = \frac{1}{2}(a + b + c)$, we shall find

$$\cos. \tfrac{1}{2} A = R \sqrt{\frac{\sin. s \sin. (s - a)}{\sin. b \sin. c}}. \qquad (2)$$

By subtracting cos. A from R instead of adding, we shall obtain, in a similar manner,

$$\sin. \tfrac{1}{2} A = R \sqrt{\frac{\sin. (s - b) \sin. (s - c)}{\sin. b \sin. c}}. \qquad (3)$$

Either formula (2) or (3) may be employed to compute the angles of a spherical triangle when the three sides are known.

Ex. 1. In a spherical triangle there are given $a = 63° 50'$, $b = 80° 19'$, and $c = 120° 47'$. Required the three angles.

Here half the sum of the sides is $132° 28' = s$.

Also, $s - a = 68° 38'$.

Using formula (2), we have,

log. sine s,	132° 28′		9·867862
log. sine $s - a$,	68° 38′		9·969075
— log. sine b,	80° 19′	comp.	0·006232
— log. sine c,	120° 47′	comp.	0·065952
		Sum	10·909121
log. cos. $\frac{1}{2}A$,	25° 45′ 19″		9·954560.

Hence the angle $A = 51° 30' 38''$.

The remaining angles may be found by Theorem III., or by a formula similar to formula (2).

$$\cos. \tfrac{1}{2} B = R \sqrt{\frac{\sin. s \sin. (s - b)}{\sin. a \sin. c}}.$$

We thus find the angle $B = 59° 16' 46''$,
and $C = 131° 28' 36''$.

Ex. 2. In a spherical triangle there are given $a = 115° 20'$, $b = 57° 30'$, and $c = 82° 28'$. Required the three angles.

Ans. $\begin{cases} A = 120° 35' 2''. \\ B = 48° 31' 42''. \\ C = 61° 43' 58''. \end{cases}$

By means of the polar triangle, we may convert the preceding formulæ for angles into formulæ for the sides of a triangle, since the angles of every triangle are the supplements of the sides of its polar triangle. Let, then, a', b', c', A', B', C', represent the sides and angles of the polar triangle, and we shall have,

$$A' = 180° - a, \quad B' = 180° - b, \quad C' = 180° - c,$$
$$a' = 180° - A, \quad b' = 180° - B, \quad c' = 180° - C.$$

Therefore, cos. $\frac{1}{2}A' = \cos. (90° - \frac{1}{2}a) = \sin. \frac{1}{2}a$,
$\sin. b' = \sin. (180° - B) = \sin. B$,
$\sin. c' = \sin. (180° - C) = \sin. C$,

Also, if we put $s' =$ half the sum of the angles of the polar triangle, we shall have,

$$s' = 270° - s,$$
and $\sin. s' = -\cos. s$
$\sin. (s' - a') = \sin. [90° - (s - A)] = \cos. (s - A)$.

By substituting these values, formula (3) becomes,

$$\cos. \tfrac{1}{2} a = R \sqrt{\frac{\cos. (s - B) \cos. (s - C)}{\sin. B \sin. C}}, \qquad (4)$$

and formula (2) becomes,

$$\sin. \tfrac{1}{2} a = R \sqrt{\frac{-\cos. s \cos. (s - A)}{\sin. B \sin. C}}, \qquad (5)$$

which formulæ enable us to compute the sides of a triangle when the three angles are known.

By means of the polar triangle, we derive from formula (1),

$$R^2 \cos. A = \cos. a \sin. B \sin. C - R \cos. B \cos. C. \qquad (6)$$

Ex. 1. In a spherical triangle A B C, there are given $A = 130° 30'$, $B = 30° 50'$, and $C = 32° 5'$. Required the three sides.

Here half the sum of the angles is $96° 42' 30'' = s$

Also,
$s - A = -33° 47' 30''$.
$s - B = 65° 52' 30''$.
$s - C = 64° 37' 30''$.

Using formula (4), we have,

log. cos. $(s - a)$,	65° 52′ 30″		9·611435
log. cos. $(s - c)$,	64° 37′ 30″		9·631992
— log. sin. B,	30° 50′	comp.	0·290270
— log. sin. C,	32° 5′	comp.	0·274781
		Sum	10·808478
log. cos. $\frac{1}{2}a$,	36° 40′ 1″		9·904239

Hence the side $a = 73° 20' 2''$.

The remaining sides may be found by Theorem III., or by a formula similar to formula (4).

$$\cos. \tfrac{1}{2} b = R \sqrt{\frac{\cos. (s - A) \cos. (s - C)}{\sin. A \sin. C}}.$$

We thus find the side $b = 40° 13' 12''$,
and $c = 42° 0' 12''$.

Ex. 2. In the spherical triangle A B C, the angle $A = 120° 30'$, $B = 54° 35'$, and $C = 63° 5'$. Required the three sides.

Ans. $\begin{cases} a = 120° 57' 5''. \\ b = 64° 55' 37''. \\ c = 82° 19' 0''. \end{cases}$

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Formula (1) will also furnish a new test for removing the ambiguity of the solution in Case I. of oblique-angled triangles. For we have,

$$\cos. A = \frac{R^2 \cos. a - R \cos. b \cos. c}{\sin. b \sin. c}.$$

Now if cos. a is greater than cos. b, the sign of the second member of this equation will be the same as that of cos. a. Hence cos. A and cos. a will have the same sign; or A and a will be of the same species when cos. a > cos. b, or sin. a < sin. b; that is,

If the sine of the side opposite to the required angle is less than the sine of the other given side, there will be but one triangle.

But if cos. a is less then cos. b, then whether the right-hand member be plus or minus will depend upon the magnitude of cos. c; or cos. c will have two values, corresponding to + cos. A and — cos. A; hence,

If the sine of the side opposite to the required angle is greater than the sine of the other given side, there will be two triangles.

Formula (6) will furnish a test for removing the ambiguity in Case II. of oblique-angled triangles. For we have,

$$\cos. a = \frac{R^2 \cos. A + R \cos. B \cos. C}{\sin. B \sin. C};$$

from which it follows, as in the preceding case, that if cos. A is greater than cos. B, A and a will be of the same species. But if cos. A is less than cos. B, then C may be taken so as to render cos. B positive or negative. Hence, *if the sine of the angle opposite to the required side is less than the sine of the other given angle, there will be but one triangle;* but *if the sine of the angle opposite to the required side be greater than the sine of the other given angle, there will be two triangles.*

LESSONS IN READING AND ELOCUTION.

No. XXX

THE SCHOLAR'S MISSION.

The wants of our time and country, the constitution of our modern society, our whole position,—personal and relative,—forbid a life of mere scholarship or literary pursuits to the great majority of those who go out from our colleges. However it may have been in other times, and other lands, here and now, but few of our educated men are privileged

> "From the loopholes of retreat
> To look upon the world, to hear the sound
> Of the great Babel, and not feel its stir."

Society has work for us, and we must forth to do it. Full early and hastily we must gird on the manly gown, gather up the loose leaves and scanty fragments of our youthful lore, and go out among men, to act with them and for them. It is a practical age; and our Wisdom, such as it is, "must strive and cry, and utter her voice in the streets, standing in the places of the paths, crying in the chief place of concourse, at the entry of the city, and the coming in at the doors."

This state of things, though not suited to the tastes and qualities of all, is not, on the whole, to be regretted by educated men as such. It is not in literary production only, or chiefly, that educated mind finds fit expression, and fulfils its mission in honour and beneficence. In the great theatre of the world's affairs, there is a worthy and a sufficient sphere. Society needs the well-trained, enlarged, and cultivated intellect of the scholar in its midst; needs it, and welcomes it, and gives it a place, or, by its own capacity, it will take a place of honour, influence, and power. The youthful scholar has no occasion to deplore the fate that is soon to tear him from his studies, and cast him into the swelling tide of life and action. None of his disciplinary and enriching culture will be lost, or useless, even there. Every hour of study, every truth he has reached, and the toilsome process by which he reached it: the heightened grace or vigour of thought or speech he has acquired,—all shall tell fully, nobly, if he will give heed to the conditions. And one condition, the prime one, is, that he be a true man, and recognise the obligation of a man, and go forth with heart and will, and every gift and acquirement dedicated, lovingly and resolutely, to the true and the right. These are the terms; and apart from these there is no success, no influence to be had which an ingenuous mind can desire, or which a sound and far-seeing mind would dare to seek.

Indeed, it is not an easy thing, nay, it is not a possible thing, to obtain a substantial success, and an abiding influence, except on these terms. A factitious popularity, a transient notoriety, or, in the case of shining talents, the doom of a damning *fame*, may fall to bad men. But an honoured name, enduring influence, a sun brightening on through its circuit, more and more, even to its serene setting,—this boon of a true success goes never to intellectual qualities alone. It gravitates slowly but surely to weight of character, to intellectual ability rooted in principle.—*George Putnam.*

THE TREASURE THAT WAXETH NOT OLD.

Oh! I have loved, in youth's fair vernal morn,
To spread imagination's wildest wing,
The sober certainties of life to scorn,
And seek the visioned realms that poets sing,—
Where Nature blushes in perennial spring,
Where streams of earthly joy exhaustless rise,
Where Youth and Beauty tread the choral ring,
And shout their raptures to the cloudless skies,
While every jovial hour on downy pinion flies.

But, ah! those fairy scenes at once are fled,
Since stern experience waved her iron wand,
Broke the soft slumbers of my visioned head,
And bade me here of perfect bliss despond.
And oft have I the painful lesson conned;
When Disappointment mocked my wooing heart,
Still of its own delusion weakly fond,
And from forbidden pleasures loth to part,
Though shrinking oft beneath Correction's deepest smart.

And is there naught in mortal life, I cried,
Can soothe the sorrows of the labouring breast?
No kind recess where baffled hope may hide,
And weary nature lull her woes to rest?
Oh! grant me, pitying Heaven, this last request,—
Since I must every loftier wish resign,
Be my few days with peace and friendship blessed;
Nor will I at my humble lot repine,
Though neither wealth, nor fame, nor luxury be mine.

Oh! give me yet, in some recluse abode,
Encircled with a faithful few, to dwell,
Where power cannot oppress, nor care corrode,
Nor venomed tongues the tale of slander tell;
Oh! bear me to some solitary cell,
Beyond the reach of every human eye;
And let me bid a long and last farewell
To each alluring object 'neath the sky,
And there in peace await my hour,—in peace to die.

"Ah, vain desire!" a still small voice replied,—
"No place, no circumstance can Peace impart:
She scorns the mansion of unvanquished Pride,—
Sweet inmate of a pure and humble heart.
Take then thy station,—act thy proper part;—
A Saviour's mercy seek,—his will perform:
His word has balm for sin's envenomed smart,
His love, diffused, thy shuddering breast shall warm,
His power provide a shelter from the gathering storm."

Oh! welcome hiding place! Oh! refuge meet
For fainting pilgrims, on this desert way!
Oh! kind Conductor of these wandering feet
Through snares and darkness, to the realms of day!
So did the Sun of Righteousness display
His healing beams; each gloomy cloud dispel:
While on the parting mist, in colours grey,
Truth's cheering bow of precious promise fell,
And Mercy's silver voice soft whispered,—"All is well."

D. Huntington.

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THE YOUNG MARINER'S DREAM.

In slumbers of midnight the sailor boy lay,
His hammock swung loose at the sport of the wind;
But, watchworn and weary, his cares flew away,
And visions of happiness danced o'er his mind.

He dreamed of his home, of his dear native bowers,
And pleasures that waited on life's merry morn;
While memory each scene gaily covered with flowers,
And restored every rose, but secreted its thorn.

Then fancy her magical pinions spread wide,
And bade the young dreamer in ecstacy rise;—
Now far, far behind him, the green waters glide,
And the cot of his forefathers blesses his eye.

The jessamine clambers, in flower, o'er the thatch;
And the swallow sings sweet from her nest in the wall;
All trembling with transport, he raises the latch;
And the voices of loved ones reply to his call.

A father bends o'er him with looks of delight;
His cheek is impearled with a mother's warm tear;
And the lips of the boy in a love-kiss unite,
With those of the sister his bosom holds dear.

The heart of the sleeper beats high in his breast,
Joy quickens his pulses,—his hardships seem o'er;
And a murmur of happiness steals through his rest,—
"O God! thou hast blest me; I ask for no more."

Ah! whence is that flame which now bursts on his eye?
Ah! what is that sound which now larums his ear?
'Tis the lightning's red glare, painting wrath on the sky!
'Tis the crashing of thunders, the groan of the sphere!

He springs from his hammock,—he flies to the deck,—
Amazement confronts him with images dire,—
Wild winds and mad waves drive the vessel a wreck,—
The masts fly in splinters,—the shrouds are on fire!

Like mountains the billows tremendously swell:
In vain the lost wretch calls on mercy to save;
Unseen hands of spirits are singing his knell,
And the death angel flaps his broad wing o'er the wave.

O sailor boy! woe to thy dream of delight!
In darkness dissolves the gay frost-work of bliss;
Where now is the picture that fancy touched bright,
Thy parents' fond pressure, and love's honied kiss?

O sailor boy! sailor boy! never again
Shall home, love, or kindred, thy wishes repay;
Unblessed, and unhonoured, down deep in the main,
Full many a score fathom, thy frame shall decay.

No tomb shall e'er plead to remembrance for thee,
Or redeem form or fame from the merciless surge;
But the white foam of waves shall thy winding-sheet be,
And winds, in the midnight of winter, thy dirge!

On a bed of green sea-flower thy limbs shall be laid;
Around thy white bones the red coral shall grow;
Of thy fair yellow locks, threads of amber be made,
And every part suit to thy mansion below.

Days, months, years, and ages, shall circle away,
And still the vast waters above thee shall roll:
Earth loses thy pattern for ever and aye;—
O sailor boy! sailor boy! peace to thy soul!

Dimond.

THE VICTOR ANGELS.

Now when fair morn orient in Heaven appeared,
Up rose the victor Angels, and to arms
The matin trumpet sung: in arms they stood
Of golden panoply, refulgent host,
Soon banded; others from the dawning hills
Looked round, and scouts each coast light armed scour
Each quarter, to descry the distant foe,
Where lodged, or whither fled, or if for fight,
In motion or in halt: him soon they met
Under spread ensigns moving nigh, in slow
But firm battalion; back with speediest sail
Zophiel, of Cherubim the swiftest wing,
Came flying, and in mid air aloud thus cried;
'Arm, Warriors, *arm for fight*,—the foe at hand,
Whom fled we thought, will save us long pursuit
This day; fear not his flight: so thick a cloud
He comes: and settled in his face I see
Sad resolution and secure: let each
His adamantine coat gird well,—and each
Fit well his helm,—gripe fast his orbed shield,
Borne even or high; for this day will pour down,
If I conjecture aught, no drizzling shower,
But rattling storm of arrows barbed with fire.'
So warned he them, aware themselves, and soon
In order, quit of all impediment;
Instant, without disturb, they took alarm,
And onward move, embattled: when behold!
Not distant far, with heavy pace the foe,
Approaching, gross and huge, in hollow cube,
Training his devilish enginery, impaled
On every side with shadowing squadrons deep,
To hide the fraud. At interview both stood
A while; but suddenly at head appeared
Satan, and thus was heard commanding loud:
"Vanguard, to right and left the front unfold,
That all may see who hate us, how we seek
Peace and composure, and with open breast
Stand ready to receive them, if they like
Our overture, and turn not back perverse."

Milton.

ANSWERS TO CORRESPONDENTS.

DECIMAL.—Yes.

E. P.—Being a minor, you are not legally responsible.

R. O. Z.—Many are coloured with water colours; a little gall is occasionally used, in order to paint the colour more evenly.

A. B. M.—There is nothing inconsistent between the science of geology and the Holy Scriptures. God's Word and God's works do not—cannot—contradict each other.

R. W. D.—We should advise you to complete your set of the POPULAR EDUCATOR from the present re-issue. We have not the complete numbers of the old edition in stock.

AN ADMIRER.—The first book printed in English was "The Game and Playe of Chesse," but it was not the first book printed by Caxton. The first book he printed was a translation from the French of the "History of Troy," and was issued at Cologne.

W. L. F.—Deuteronomy is the name given to the fifth book of Moses, because of its containing a *second* account, or recapitulation of the law, the name being derived from two Greek words, signifying *second* and *law*. The word "esquire" is derived from the French *escuier*, or shield-bearer; it is the next title of dignity to that of a knight. The title is given by courtesy to gentlemen of property, to professional gentlemen, and occasionally to others who have not in strictness any claim to it as a distinct title or dignity.

END OF VOL. VI.

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